

## APPENDIX E.9

### Aquatic Effects Monitoring Reports

## APPENDIX E.9.1

### 2020 CREMP Monitoring Report



**Mary River Project 2020  
Core Receiving Environment Monitoring  
Program Report**

**Part 1 of 3  
(Sections 1 to 7)**

Prepared for:  
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# **Mary River Project 2020**

## **Core Receiving Environment Monitoring**

### **Program Report**

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## EXECUTIVE SUMMARY

The Mary River Project (the Project) is an operating high-grade iron mine located in the Qikiqtani Region of northern Baffin Island, Nunavut. Owned and operated by Baffinland Iron Mines Corporation (Baffinland), the mine began commercial operation in 2015. Mining activities at the Project include open pit ore extraction, ore haulage, stockpiling, crushing, and screening, followed by transport by truck to Milne Port for subsequent seasonal loading onto bulk carrier ships for transfer to international markets. No milling or additional processing of the ore is conducted on-site and therefore no tailings are produced at the Project. Mine waste management facilities at the mine site include a mine waste rock stockpile and surface runoff collection/containment ponds situated near the mine waste rock stockpile and ore stockpile areas. In addition to periodic discharge of treated effluent from these facilities to the Mary River system, other potential mine inputs to aquatic systems located adjacent to the Mine Site include runoff and dust from ore (crusher) stockpiles located within the Sheardown Lake catchment, treated sewage effluent discharge to Mary River, runoff and explosives residue deposition from quarry operations within the Camp Lake catchment, deposition of fugitive dust generated by mine activities, and general mine site runoff.

Under the terms and conditions of the Project's Type 'A' Water Licence issued by the Nunavut Water Board, Baffinland was required to develop and implement an Aquatic Effects Monitoring Plan (AEMP) at the Mine Site. In order to meet the AEMP objectives, Baffinland developed a Core Receiving Environment Monitoring Program (CREMP) to provide a basis for the evaluation of mine-related influences on water quality, sediment quality, and/or aquatic biota (including phytoplankton, benthic invertebrates, and fish). The primary receiving systems that serve as the focus for the CREMP include the Camp Lake system (i.e., Camp Lake tributaries 1 and 2, Camp Lake), the Sheardown Lake system (i.e., Sheardown Lake tributaries 1, 9, and 12, Sheardown Lake northwest basin, and Sheardown Lake southeast basin), and the Mary River and Mary Lake system. Potential mine related effects within the mine primary receiving systems have been assessed annually under the CREMP since the commencement of commercial mine operation in 2015 using a combination of comparisons to site-specific benchmarks for water and sediment quality developed for the AEMP and application of an effects-based approach using standard environmental effects monitoring techniques. Annual results from the CREMP are applied within a four-step Assessment Approach and Management Response Framework designed for the Mary River Project AEMP to then guide management response decisions related to changes in parameter concentrations and/or aquatic biota attributable to mine operations.

The results of the 2020 CREMP indicated mine-related influences on water and sediment quality at some of the primary receiving systems, but no ecologically significant, adverse, mine-related



effects to biota were identified at any of the receiving waterbodies based on comparisons to applicable reference and/or baseline conditions. Within the Camp Lake system, copper concentrations were elevated above site-specific AEMP water quality benchmarks at the north branch of Camp Lake Tributary 1 (CLT1) in 2020, but because this elevation in copper concentrations did not appear to be mine-related, a low action response to identify the source of copper to the CLT1 north branch using expanded water quality monitoring is recommended. At the CLT1 upper main stem, iron concentrations were elevated above AEMP water quality benchmarks, concentrations at reference creeks, and concentrations during baseline, indicating a mine-related change that prompted a low action response recommendation to establish assess effects on biota within the upper main stem through the establishment of benthic invertebrate community sampling stations. At Camp Lake Tributary 2, no changes in concentrations of AEMP benchmark parameters occurred relative to background or to baseline and no adverse biological effects were indicated in 2020, and thus no adjustments to the existing AEMP are recommended. At Camp Lake, arsenic concentrations were elevated within littoral sediment compared to reference lake sediments and to Camp Lake baseline data. No mine-related sources of arsenic to the Camp Lake system have been evident currently or in the past, and therefore a low action response to harmonize sediment quality and benthic invertebrate community monitoring stations using increased replication at littoral habitat of Camp Lake is recommended. No

Within the Sheardown Lake system, copper concentrations were elevated above site-specific AEMP water quality benchmarks at Sheardown Lake Tributary 1 (SDLT1) in 2020, but because this elevation in copper concentrations did not appear to be mine-related, a low action response is recommended to identify the source of copper to SDLT1 using expanded water quality monitoring. No mine-related changes to phytoplankton or benthic invertebrates were indicated at Sheardown Lake tributaries 9 and 12 in 2020, but because water quality is not monitored at these tributaries under the current AEMP, a low action response to add a water quality monitoring station at each of these two tributaries is recommended to improve the ability of the program to interpret biological data in the future. At the Sheardown Lake northwest (NW) and southeast (SE) basins, water quality consistently met AEMP benchmarks and, despite arsenic, chromium, iron, manganese, and/or nickel concentrations above AEMP benchmarks for sediment quality at one or both basins, concentrations of all these metals were comparable to those of background and/or basin-specific baseline indicating no mine-related change in metal concentrations. Because concentrations of metals in Sheardown Lake sediment were similar to those shown at the reference lake and/or baseline, it is recommended that consideration be given to updating the AEMP sediment quality benchmarks for Sheardown Lake to reflect both reference lake and baseline data.



Within the Mary River/Mary Lake system, no mine-related effects to water quality were indicated based on comparison to reference areas and to baseline data. An AEMP benchmark for sediment quality was exceeded for manganese at a single profundal station at Mary Lake in 2020, but based on the isolated occurrence of this exceedance and the fact that average manganese concentrations in sediment at Mary Lake were not elevated compared to concentrations at the reference lake or to those during baseline, no mine-related change in manganese concentrations were indicated at Mary Lake. Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no changes to AEMP monitoring at Mary River/Mary Lake are recommended.



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## ACRONYMS AND ABBREVIATIONS

**AEMP** – Aquatic Effects Monitoring Plan  
**ANCOVA** – Analysis-of-Covariance  
**ANOVA** – Analysis-of-Variance  
**BCWQG** – British Columbia Water Quality Guidelines  
**CES** – Critical Effect Size  
**cm** – Centimetre  
**CPUE** – Catch-Per-Unit-Effort  
**CREMP** – Core Receiving Environment Monitoring Program  
**CSQG** – Canadian Sediment Quality Guidelines  
**CWQG** – Canadian Water Quality Guidelines  
**dbRDA** – Distance-Based Redundancy Analysis  
**DELT** – Deformities, Erosions, Lesions, And Tumors  
**DOC** – Dissolved Organic Carbon  
**DSS** – Digital Sampling System  
**EEM** – Environmental Effects Monitoring  
**ERP** – Early Revenue Phase  
**FFG** – Functional Feeding Group  
**GPS** – Global Positioning System  
**HPG** – Habit Preference Group  
**HSD** – Honestly Significant Difference  
**KS** – Kolmogorov-Smirnov  
**L** – Litre  
**MDL** – Method Detection Limit  
**MRTF** – Mary River Tributary-F  
**Mt** – Million Tonnes  
**NAD 83** – 1983 North American Datum  
**NSES** – North Shore Environmental Services  
**NU** – Nunavut  
**NWB** – Nunavut Water Board  
**PEL** – Probable Effect Level  
**PSQG** – Ontario Provincial Sediment Quality Guidelines  
**PWQO** – Ontario Provincial Water Quality Objectives  
**QA/QC** – Quality Assurance/Quality Control  
**SD** – Standard Deviation



**SEL** – Severe Effect Levels

**SQG** – Sediment Quality Guidelines

**TDS** – Total Dissolved Solids

**TKN** – Total Kjeldahl Nitrogen

**TMAES** – Trinity Minnow Aquatic Environmental Services

**TOC** – Total Organic Carbon

**TSS** – Total Suspended Solids

**UTM** – Universal Transverse Mercator

**WQG** – Water Quality Guidelines

**YOY** – Young-Of-The-Year



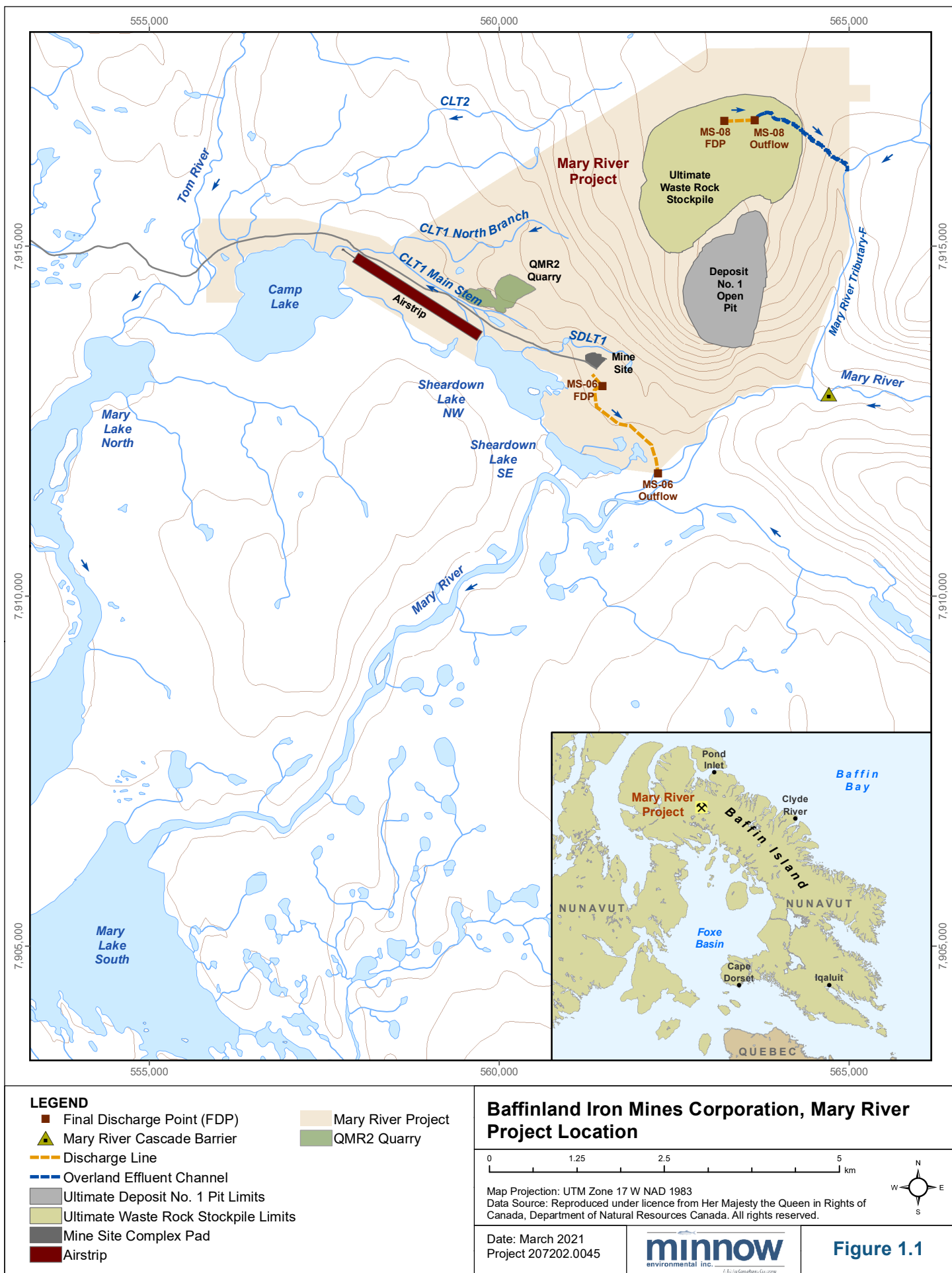
# 1 INTRODUCTION

The Mary River Project (the Project), owned and operated by Baffinland Iron Mines Corporation (Baffinland), is a high-grade iron ore mining operation located in the Qikiqtani Region of northern Baffin Island, Nunavut (NU) (Figure 1.1). Commercial open pit mining, including pit bench development, ore haulage, and ore stockpiling, as well as the crushing and screening of high-grade iron ore, commenced at the Project Mine Site in 2015. In the current mining phase, referred to as the Early Revenue Phase (ERP), up to 6 million tonnes (Mt) of crushed/screened ore is mined annually at the Project. Ore from the Project Mine Site is transported in haul trucks along the Milne Inlet Tote Road to Milne Port, located approximately 100 km north of the Mine Site, where it is stockpiled. At Milne Port, the ore is loaded onto bulk carrier ships for transport to international markets during the shipping season. No milling or additional ore processing is conducted at the Mine Site, and thus no tailings are produced at the Project. Mine waste management facilities at the Mary River Project thus consist simply of a mine waste rock stockpile and surface runoff collection/containment ponds currently situated near the mine waste rock stockpile and ore stockpile areas. In addition to periodic discharge of treated effluent from these facilities to the Mary River system, other potential mine inputs to aquatic systems located adjacent to the mine include runoff and dust from ore (crusher) stockpiles located on the Mine Site within the Sheardown Lake catchment, treated sewage effluent discharge to Mary River, runoff and explosives residue deposition from quarry operations to the Camp Lake catchment, deposition of fugitive dust generated by mine activities, and general Mine Site runoff.

Under the terms and conditions of the Project's Type 'A' Water Licence (No. 2AM-MRY1325 Amendment No. 1) issued by the Nunavut Water Board (NWB), Baffinland developed an Aquatic Effects Monitoring Plan (AEMP) for the Project. A key objective of the AEMP was to provide data and information to allow for the evaluation of short- and long-term effects of the Project on aquatic ecosystems. To meet this objective, Baffinland developed a Core Receiving Environment Monitoring Program (CREMP) to assess potential mine-related influences on water quality, sediment quality, and biota (including phytoplankton, benthic invertebrates, and fish) at aquatic environments located near the mine (Baffinland 2015; KP 2014; NSC 2014). The primary receiving systems that are the focus for the CREMP include the Camp Lake system (Tributaries 1 and 2, Camp Lake), the Sheardown Lake system (Tributaries 1, 9, and 12, Sheardown Lake northwest [NW], and Sheardown Lake southeast [SE]), Mary River, and Mary Lake (Figure 1.1). Over the initial five years of mine operation, the CREMP studies have indicated only minimal effects of Project operations on the water quality and sediment quality of receiving waterbodies. Potential effects were confined to single tributaries feeding into each of Camp and Sheardown lakes, as well as near the immediate outlet of these tributaries to each respective lake







(Minnow 2016a, 2017, 2018, 2019). No adverse mine-related effects to phytoplankton, benthic invertebrates, or fish were indicated at any of the Camp Lake, Sheardown Lake, or Mary Lake systems from 2015 to 2019 based on comparisons to reference waterbodies and to available pre-mine baseline data for each lake system (Minnow 2016a, 2017, 2018, 2019).

This report presents the methods and results of the 2020 CREMP, including an evaluation of potential Project-related influences on chemical and biological conditions at mine-exposed waterbodies through the sixth full year of mine operation. As in the five previous years, the 2020 Mary River Project CREMP included water quality monitoring, sediment quality monitoring, phytoplankton monitoring, benthic invertebrate community assessment, and an arctic charr (*Salvelinus alpinus*) fish population assessment. The 2020 CREMP was implemented in accordance with the original study design (Baffinland 2015) with the exception of the continued use of a reference creek benthic invertebrate community study area added to the program in 2016 to provide improved ability for the evaluation of mine-related influences on stream biota (Minnow 2016b, 2017, 2018, 2019, 2020).





## 2 METHODS

### 2.1 Overview

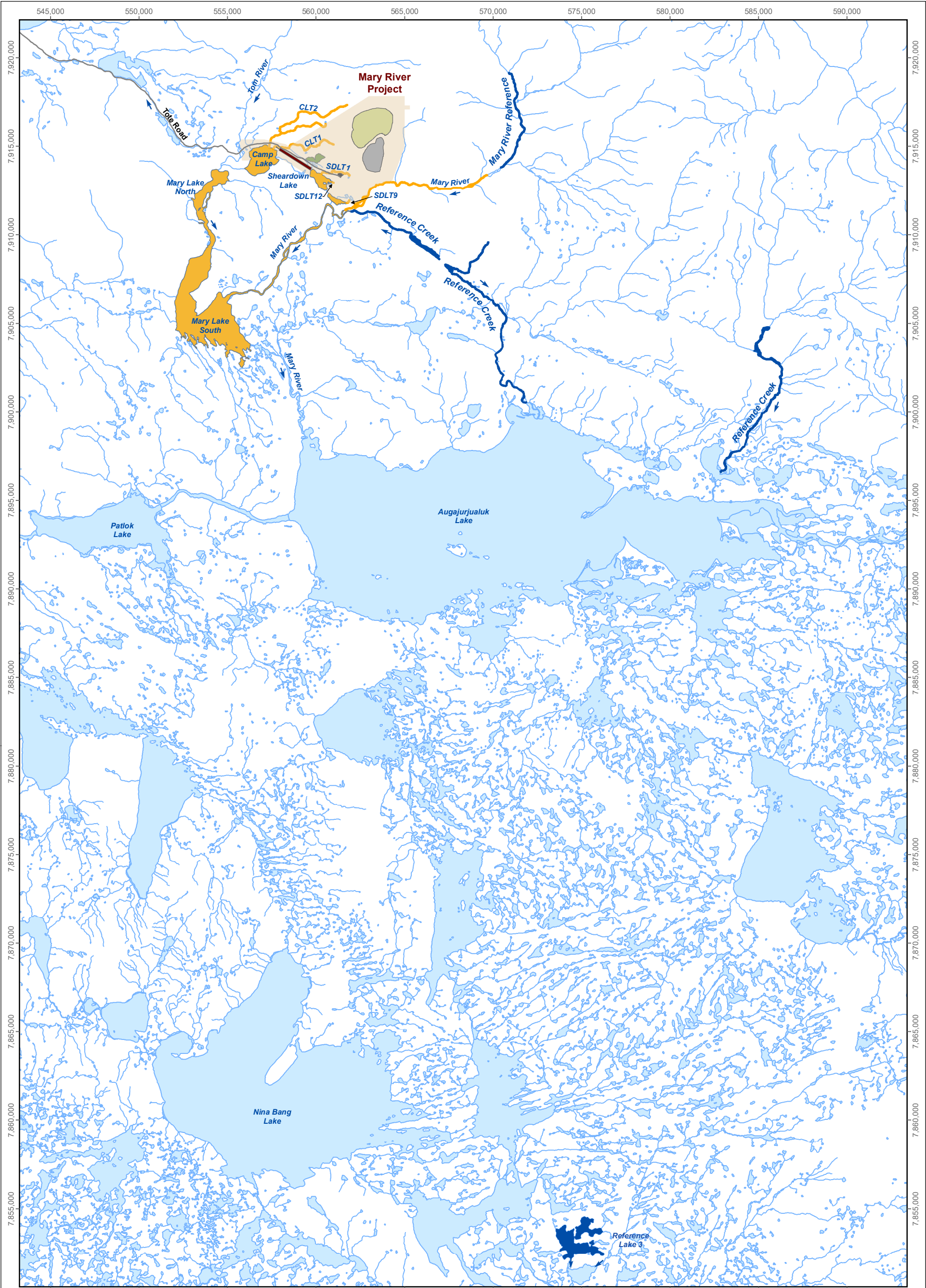
The CREMP includes water quality monitoring, sediment quality monitoring, phytoplankton (chlorophyll-a) monitoring, benthic invertebrate community assessment, and fish population assessment (Baffinland 2015). In 2020, water quality and phytoplankton monitoring were conducted by Baffinland environment department personnel over four separate sampling events, including a lake ice-cover event (April 12<sup>th</sup> to 24<sup>th</sup>) and open-water season events corresponding to Arctic spring (freshet), summer, and fall (June 2<sup>nd</sup> to 4<sup>th</sup>, July 28<sup>th</sup> to August 3<sup>rd</sup>, and August 26<sup>th</sup> to 30<sup>th</sup>, respectively). Sediment quality, benthic invertebrate community, and fish population sampling was conducted by Trinity Minnow Aquatic Environmental Services (TMAES) personnel with assistance from Baffinland environment department personnel from August 8<sup>th</sup> to 20<sup>th</sup> 2020, the seasonal timing of which was consistent with monitoring conducted for previous baseline (2005 to 2013), mine construction (2014), and mine operational (2015 to 2019) studies. Similar to previous CREMP studies, the 2020 study included field sampling and standard laboratory quality assurance/quality control (QA/QC) for the water quality and benthic invertebrate community study components to allow for an assessment of the overall quality of each respective data set (Appendix A).

The 2020 CREMP study areas included the same mine-exposed and reference waterbodies established in the original design documents (Baffinland 2015) and the same reference lake that was added to the program in 2015 (Figure 2.1). To simplify the discussion of results, the mine-exposed study areas were separated by lake catchment as follows:

- the Camp Lake system (Camp Lake Tributaries 1 and 2, and Camp Lake);
- the Sheardown Lake system (Sheardown Lake Tributaries 1, 9, and 12, Sheardown Lake NW, and Sheardown Lake SE); and,
- the Mary River/Mary Lake system.

Reference Lake 3, which served as a reference waterbody for lentic (lake) environments beginning in the 2015 CREMP study, was again used as the reference lake for the 2020 study. Reference Lake 3 is located approximately 62 km south of the Mine Site (Figure 2.1), well outside the area of mine influence. Streams used as reference areas in the current and previous CREMP included an unnamed tributary to the Mary River and two unnamed tributaries to Angajurjualuk Lake, all of which are located southeast of the Mine Site (Figure 2.1). Similar to previous CREMP studies, an area of Mary River located well upstream of current mine activity

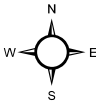
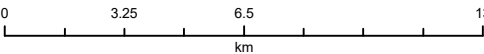




**LEGEND**

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| Reference Stream/River System    | Ultimate Deposit No. 1 Pit Limits    |
| Mine Exposed Stream/River System | Ultimate Waste Rock Stockpile Limits |
| Reference Lake                   | Mine Site Complex Pad                |
| Mine Exposed Lake                | Airstrip                             |
|                                  | QMR2 Quarry                          |
|                                  | Mary River Project                   |

**Mary River Project CREMP Study Waterbodies**



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Date: March 2021  
Project 207202.0045



**Figure 2.1**

(i.e., GO-09) served as a reference area for the mine-exposed portion of Mary River in the 2020 study (Figure 2.1).

## **2.2 Water Quality**

### **2.2.1 General Design**

Surface water quality monitoring was conducted by Baffinland environment department personnel at the sampling locations and frequencies stipulated in the CREMP design (Baffinland 2015). The surface water sampling was conducted at as many as 57 stations during each sampling event (Table 2.1; Figures 2.2 and 2.3) and included collection of *in situ* measurements and water chemistry data. The evaluation of potential mine-related effects on surface waters in the vicinity of the Project was based upon comparisons of those parameters for which AEMP benchmarks have been developed to applicable reference data, to available baseline data, and to guidelines that included site-specific AEMP benchmarks. The AEMP benchmarks were developed to aid in defining effects of the Project on surface water quality, and to guide management response decisions to elevations above the benchmarks within a four-step Assessment Approach and Management Response Framework (Baffinland 2015).

### **2.2.2 *In situ* Water Quality Measurement Data Collection and Analysis**

*In situ* measurements of water temperature, dissolved oxygen, pH, specific conductance (i.e., temperature standardized measurement of conductivity), and turbidity were taken at the bottom of the water column at all lotic (i.e., creek, river) stations and as a vertical profile at one metre (m) intervals at each lentic (i.e., lake) water quality monitoring station during routine monitoring conducted by Baffinland personnel. These *in situ* measurements were also collected at the surface and bottom (i.e., approximately 30 centimetres [cm] above the water-sediment interface) at all lake benthic invertebrate community (benthic) stations during biological sampling conducted in August by TMAES personnel, except for turbidity measurements. The *in situ* measurements were collected using one of three YSI ProDSS (Digital Sampling System) meters equipped with a 4-Port sensor (YSI Inc., Yellow Springs, OH). Meter readings for pH, specific conductance, and turbidity were checked against standard solutions and calibrated as necessary the morning of the day in which sampling was to be completed, prior to field sampling. Dissolved oxygen concentration readings were checked and calibrated at greater frequency through each sampling day in response to changing sampling conditions (e.g., changes in elevation, barometric pressure, and/or ambient temperature). During the winter ice-cover sampling event, a gas-powered, 15-cm (6-inch) diameter ice auger was used to access the water column at lake water quality monitoring stations. Ice shavings were removed from the auger hole prior to the collection of

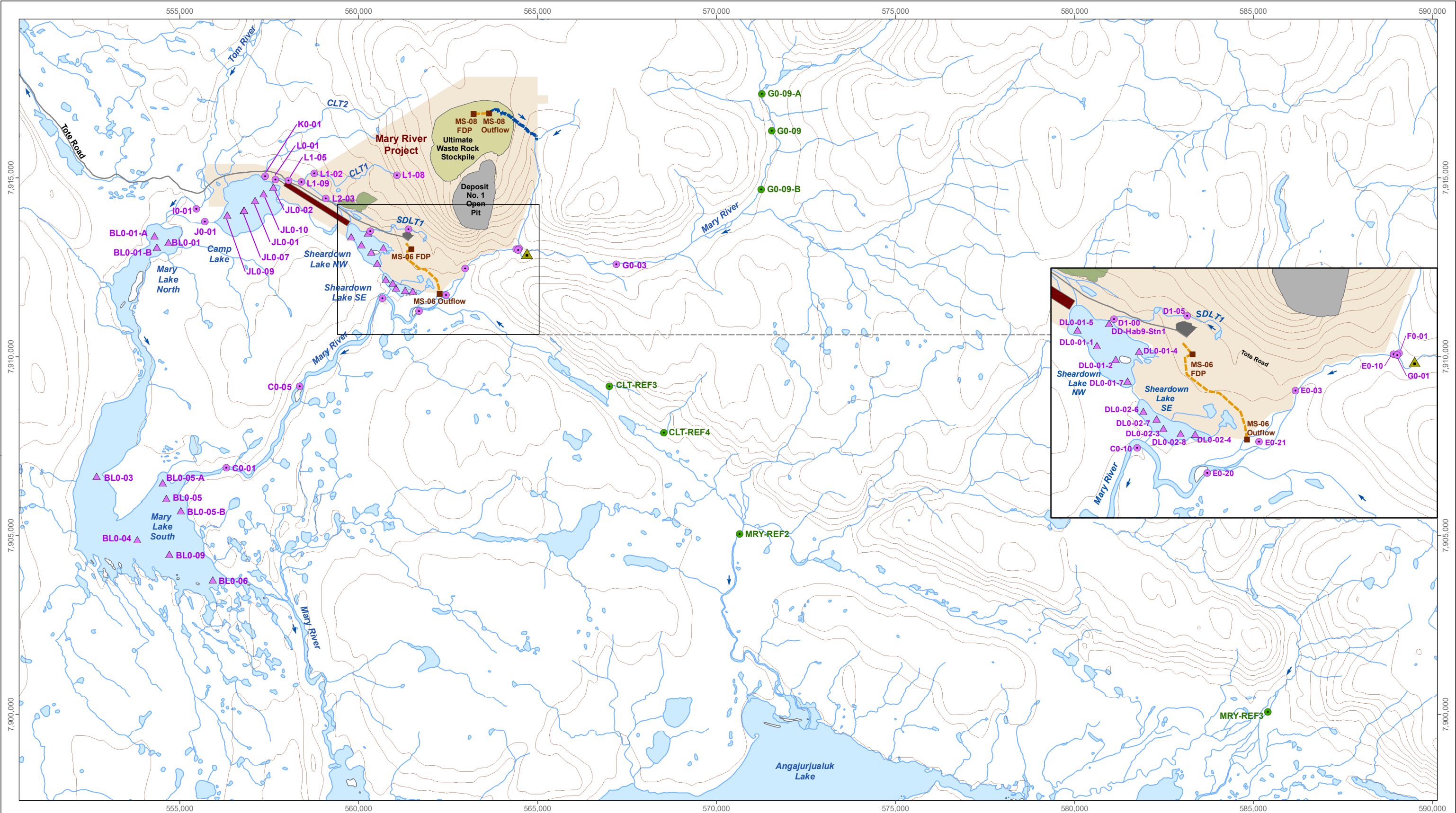


**Table 2.1: Mary River Project CREMP Water Quality and Phytoplankton Monitoring Station Coordinates and Annual Sampling Schedule**

| Study System                    | Water Body              | Station ID   | UTM Zone 17N, NAD83 |          | Ref. Data Set <sup>a</sup> | Sampling Season     |               |               |                     |
|---------------------------------|-------------------------|--------------|---------------------|----------|----------------------------|---------------------|---------------|---------------|---------------------|
|                                 |                         |              | Easting             | Northing |                            | Winter (Apr. - May) | Spring (June) | Summer (July) | Fall (Aug. - Sept.) |
| Reference Areas                 | Creek Reference         | CLT-REF3     | 567004              | 7909174  | na                         | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | CLT-REF4     | 568533              | 7907874  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | MRY-REF3     | 585407              | 7900061  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | MRY-REF2     | 570650              | 7905045  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 | Reference Lake 3        | REF-03-W1    | 575642              | 7852666  | na                         | -                   | -             | ✓             | ✓                   |
|                                 |                         | REF-03-W2    | 574836              | 7852744  |                            | -                   | -             | ✓             | ✓                   |
|                                 |                         | REF-03-W3    | 574158              | 7853237  |                            | -                   | -             | ✓             | ✓                   |
|                                 | Mary River Reference    | G0-09-A      | 571264              | 7917344  | na                         | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | G0-09        | 571546              | 7916317  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | G0-09-B      | 571248              | 7914682  |                            | -                   | ✓             | ✓             | ✓                   |
| Camp Lake System                | Camp Lake Tributaries   | I0-01        | 555470              | 7914139  | a                          | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | J0-01        | 555701              | 7913773  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | K0-01        | 557390              | 7915030  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L0-01        | 557681              | 7914959  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L1-02        | 558765              | 7915121  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L1-05        | 558040              | 7914935  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L1-08        | 561076              | 7915068  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L1-09        | 558407              | 7914885  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | L2-03        | 559081              | 7914425  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 | Camp Lake               | JL0-01       | 557108              | 7914369  | b                          | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | JL0-02       | 557615              | 7914750  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | JL0-07       | 556800              | 7914094  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | JL0-09       | 556335              | 7913955  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | JL0-10       | 557346              | 7914562  |                            | ✓                   | -             | ✓             | ✓                   |
| Sheardown Lake System           | Sheardown Tributary 1   | D1-00        | 560329              | 7913512  | a                          | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | D1-05        | 561397              | 7913558  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 | Sheardown Lake NW       | DD-Hab9-Stn1 | 560259              | 7913455  | b                          | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-01-1     | 560080              | 7913128  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-01-2     | 560353              | 7912924  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-01-4     | 560695              | 7913043  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-01-5     | 559798              | 7913356  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-01-7     | 560525              | 7912609  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 | Sheardown Lake SE       | DL0-02-3     | 561046              | 7911915  | b                          | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-02-4     | 561511              | 7911832  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-02-6     | 560756              | 7912167  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-02-7     | 560952              | 7912054  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | DL0-02-8     | 561301              | 7911846  |                            | ✓                   | -             | ✓             | ✓                   |
| Mary River and Mary Lake System | Mary River              | G0-03        | 567204              | 7912587  | c                          | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | G0-01        | 564459              | 7912984  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | F0-01        | 564483              | 7913015  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | E0-21        | 562444              | 7911724  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | E0-20        | 561688              | 7911272  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | E0-10        | 564405              | 7913004  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | E0-03        | 562974              | 7912472  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | C0-10        | 560669              | 7911633  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | C0-05        | 558352              | 7909170  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 |                         | C0-01        | 556305              | 7906894  |                            | -                   | ✓             | ✓             | ✓                   |
|                                 | Mary Lake (North Basin) | BL0-01       | 554691              | 7913194  | b                          | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-01-A     | 554300              | 7913378  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-01-B     | 554369              | 7913058  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 | Mary Lake (South Basin) | BL0-03       | 552680              | 7906651  | b                          | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-04       | 553817              | 7904886  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-05       | 554632              | 7906031  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-06       | 555924              | 7903760  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-05-A     | 554530              | 7906478  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-05-B     | 555034              | 7905692  |                            | ✓                   | -             | ✓             | ✓                   |
|                                 |                         | BL0-09       | 554715              | 7904479  |                            | ✓                   | -             | ✓             | ✓                   |

<sup>a</sup> Reference data applicable to indicated study area include a - lotic reference stations; b - lentic reference stations; and, c - Mary River upstream stations.





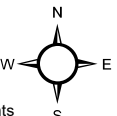
**LEGEND**  
**Water Monitoring Stations**

- Lake - Mine Exposed
- Stream - Mine Exposed
- Stream - Reference

- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Discharge Line
- Overland Effluent Channel

- Ultimate Deposit No. 1 Pit Limits
- Ultimate Waste Rock Stockpile Limits
- Mine Site Complex Pad
- Airstrip
- QMR2 Quarry

- Mary River Project
- Contours (20 m)



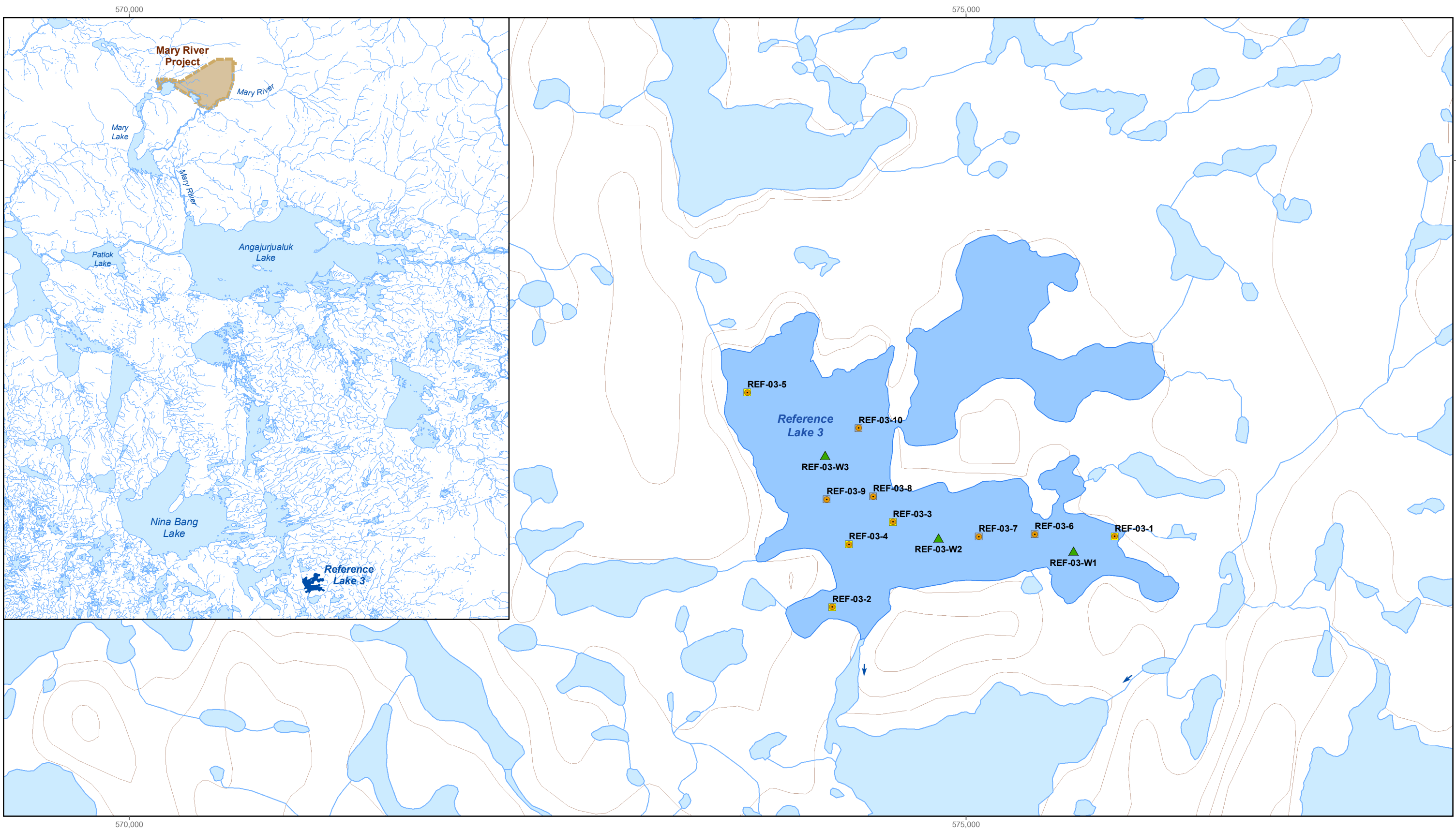
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**Mary River Project CREMP Routine Water Quality and Phytoplankton Monitoring Station Locations**

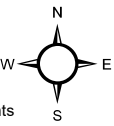
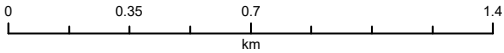
Date: March 2021  
Project 207202.0045



**Figure 2.2**



- LEGEND**
- Sediment and Benthic Monitoring Location
  - Littoral Sampling Depth
  - Profundal Sampling Depth
  - ▲ Water Quality and Phytoplankton Monitoring Station
  - Reference Lake



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### Mary River Project CREMP Reference Lake 3 Monitoring Station Locations

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 Project 207202.0045



**Figure 2.3**



*in situ* measures. To avoid confounding influences associated with snow/ice melt in the auger hole, the *in situ* measurements were collected just below the ice layer. Additional supporting observations of water colour and clarity were recorded at the time of water quality and biological sampling at all benthic stations, and Secchi depth was measured at all lake stations using the methods outlined in Wetzel and Likens (2000).

*In situ* water quality data collected at the mine-exposed study streams, rivers, and lakes were compared to respective reference area data, applicable water quality guidelines (WQG<sup>1</sup>; dissolved oxygen concentrations and pH only), and, for pH and conductivity, baseline data. *In situ* water quality data were compared spatially within each system (i.e., from upstream- to downstream-most stations) using both qualitative and statistical approaches. For the statistical analysis, raw data and log-transformed data were assessed for normality and homogeneity of variance prior to conducting comparisons between (pair-wise) or among (multiple-group) applicable like-habitat mine-exposed and reference study area groups using Analysis-of-Variance (ANOVA). The selection of untransformed or log-transformed data was determined based on which data best met the assumptions of ANOVA. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U-tests and Kruskal-Wallis H-tests were used to conduct pair-wise and multiple-group comparisons, respectively, on rank transformed data. Similarly, in instances in which variances of normal data could not be homogenized by transformation, Student's t-tests assuming unequal variance were used for pair-wise comparisons. In cases in which multiple-group comparisons were conducted, normally distributed data were subject to Tukey's Honestly Significant Difference (HSD) and Tamhane's pair-wise *post hoc* tests for homogenous and non-homogenous data, respectively. All statistical comparisons were conducted using R programming (R Foundation for Statistical Computing, Vienna, Austria).

Vertical profiles of the *in situ* measurements taken from lake stations were plotted and visually assessed to evaluate potential thermal or chemical stratification and the corresponding depths associated with distinct layering. The occurrence of a thermocline was conservatively assessed as a  $\geq 0.5^{\circ}\text{C}$  change in temperature per 1 m change in depth<sup>2</sup>. The vertical profile data collected at the mine-exposed study lakes were compared to those of the reference lake for each seasonal monitoring event using profile data averaged for each incremental depth below the water surface at each lake. At each study lake, spatial and seasonal differences in the vertical profile plots were

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<sup>1</sup> Canadian Environmental Quality Guidelines (CCME 1999, 2019) were used as the primary source for WQG, including those for pH and dissolved oxygen concentrations.

<sup>2</sup> Wetzel (2001) defines the thermocline as a  $\geq 1^{\circ}\text{C}$  change in temperature per 1 m change in depth. Through discussions regarding the CREMP in 2017, regulatory agencies requested that a  $\geq 0.5^{\circ}\text{C}$  change in temperature per 1 m change in depth be used to conservatively define a thermally stratified condition.





evaluated to provide a better understanding of natural conditions and/or mine-related influences on within-lake water quality.

### 2.2.3 Water Chemistry Sampling and Data Analysis

Surface water chemistry samples were collected from both lotic and lentic environments (Table 2.1). At lotic stations, water chemistry samples were collected from approximately mid-water column by hand directly into pre-labeled sample bottles that were triple rinsed with ambient water. For samples requiring preservation, chemical preservatives were added to the samples before capping the bottles, or for sample bottles that were pre-dosed with chemical preservatives, the bottle was filled using a sample transferred from a separate bottle. At lentic stations, two water chemistry samples were collected, one approximately 1 m below the surface (or just below the ice layer for the winter sampling event) and the other from approximately 1 m above the bottom, using a non-metallic, vertically-oriented, 2.2 litre (L) TT Silicon Kemmerer bottle (Wildco Supply Co., Yulee, FL). During the winter sampling event, the water column was accessed at the same time and using the same methods as described above for the *in situ* measurements. Lake water collected using the Kemmerer bottle was transferred directly into sample bottles that had been pre-dosed with required chemical preservatives, where appropriate, except those requiring field filtration. In cases in which filtration of lotic and lentic station water samples was required (e.g., for dissolved metals), filtration was conducted in the field using methods consistent with AEMP standard operating procedures (Baffinland 2015).

Following collection, water chemistry samples were placed into coolers in the field and maintained at cool temperatures prior to shipment to the analytical laboratory. Water chemistry sampling QA/QC included trip blanks, field blanks, and the collection of equipment blanks and field duplicates at an approximate rate of 5% of the total number of samples collected for each CREMP sampling event (Appendix A). Water chemistry samples were shipped on ice to ALS Canada Ltd. (ALS; Waterloo, ON) for analysis of pH, conductivity, hardness, total suspended solids (TSS), total dissolved solids (TDS), anions (alkalinity, bromide, chloride, sulphate), nutrients (ammonia, nitrate, nitrite, total Kjeldahl nitrogen [TKN], total phosphorus), dissolved and total organic carbon (DOC and TOC, respectively), mercury, total and dissolved metals, and phenols using standard laboratory methods.

For parameters in which water chemistry AEMP benchmarks have been developed, data were compared: i) among mine-exposed and reference areas for each study lake catchment (Table 2.1); ii) spatially and seasonally at each mine-exposed waterbody; iii) to applicable WQG for the protection of aquatic life (Table 2.2) and/or to site-specific water quality benchmarks developed for the Mary River Project AEMP (Intrinsik 2014); and, iv) to baseline water quality data. For data screening, and to simplify discussion of results, parameter concentration



Table 2.2: Water Quality Guidelines Used for the Mary River Project 2015 to 2020 CREMP Studies

| Parameters             |                             | Units | Water Quality Guideline (WQG) <sup>a</sup> | Criteria Source <sup>a</sup> | Supporting Information and/or Calculations Used to Derive Hardness Dependent Criteria                                                                                                                                                                                                                                                                                                                              |
|------------------------|-----------------------------|-------|--------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conventionals          | pH (lab)                    | pH    | 6.5 - 9.0                                  | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Nutrients and Organics | Nitrate                     | mg/L  | 3                                          | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Nitrite                     | mg/L  | 0.06                                       | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Total Phosphorus            | mg/L  | 0.020 or 0.030                             | PWQO                         | Total phosphorus objective is 0.030 mg/L for lotic (rivers, streams) environments, and 0.020 mg/L for lentic (lake) environments.                                                                                                                                                                                                                                                                                  |
|                        | Phenols                     | mg/L  | 0.001                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Anions                 | Chloride (Cl)               | mg/L  | 120                                        | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Sulphate (SO <sub>4</sub> ) | mg/L  | 218                                        | BCWQG                        | Sulphate guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent as follows: 128 mg/L at 0 to 30 hardness, 218 mg/L at 31 to 75 hardness, 309 mg/L at 76 to 180 hardness, and 429 mg/L at 181 to 250 hardness. Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with 75 mg/L hardness.                                                                       |
| Total Metals           | Aluminum (Al)               | mg/L  | 0.100                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Antimony (Sb)               | mg/L  | 0.020                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Arsenic (As)                | mg/L  | 0.005                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Beryllium (Be)              | mg/L  | 0.011                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Boron (B)                   | mg/L  | 1.5                                        | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Cadmium (Cd)                | mg/L  | 0.00012                                    | CWQG                         | Cadmium guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent. For hardness between 17 and 280 mg/L, the cadmium guideline is calculated using the equation $Cd\text{ (ug/L)} = 10^{(0.83[\log(\text{hardness}) - 2.46])}$ . Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with 75 mg/L hardness.                                                       |
|                        | Chromium (Cr)               | mg/L  | 0.0089                                     | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Cobalt (Co)                 | mg/L  | 0.001                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Copper (Cu)                 | mg/L  | 0.002                                      | CWQG                         | Copper guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent. At hardness <82 mg/L and >180 mg/L, the copper guideline is 2 and 4 ug/L, respectively. For hardness ranging from 82 to 180 mg/L, the copper guideline (ug/L) = $0.2 * e^{(0.8545[\ln(\text{hardness}) - 1.463])}$ . Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with 75 mg/L hardness. |
|                        | Iron (Fe)                   | mg/L  | 0.30                                       | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Lead (Pb)                   | mg/L  | 0.002                                      | CWQG                         | Lead guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent. At hardness <60 mg/L and >180 mg/L, the lead guideline is 1 and 7 ug/L, respectively. For hardness ranging from 60 to 180 mg/L, the lead guideline (ug/L) = $e^{(1.273[\ln(\text{hardness}) - 4.705])}$ . Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with 75 mg/L hardness.              |
|                        | Manganese (Mn)              | mg/L  | 0.935                                      | BCWQG                        | Manganese guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent, and calculated using the equation $Mn\text{ (ug/L)} = 0.0044 * (\text{hardness}) + 0.605$ . Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with hardness of 75 mg/L.                                                                                                                    |
|                        | Mercury (Hg)                | mg/L  | 0.000026                                   | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Molybdenum (Mo)             | mg/L  | 0.073                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Nickel (Ni)                 | mg/L  | 0.077                                      | CWQG                         | Nickel guideline is hardness (mg/L CaCO <sub>3</sub> ) dependent. At hardness <60 mg/L and >180 mg/L, the nickel guideline is 25 and 150 ug/L, respectively. For hardness ranging from 60 to 180 mg/L, the nickel guideline (ug/L) = $e^{(0.76[\ln(\text{hardness}) + 1.06])}$ . Sample-specific (mean) hardness was used for screening purposes. Value presented applicable to water with 75 mg/L hardness.       |
|                        | Selenium (Se)               | mg/L  | 0.001                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Silver (Ag)                 | mg/L  | 0.00025                                    | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Thallium (Tl)               | mg/L  | 0.0008                                     | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Tungsten                    | mg/L  | 0.030                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Uranium (U)                 | mg/L  | 0.015                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Vanadium (V)                | mg/L  | 0.006                                      | PWQO                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                        | Zinc (Zn)                   | mg/L  | 0.030                                      | CWQG                         | -                                                                                                                                                                                                                                                                                                                                                                                                                  |

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME1999, 2019) was selected where a CCME guideline exists. Where no CCME guideline exists, the selected criteria is the lowest of either the Ontario Provincial Water Quality Objective (PWQO; OMOE 1994) or the British Columbia Water Quality Guideline (BCWQG; BCMOE 2019), as available.

enrichment factors were calculated as the mine-exposed area mean concentration divided by the respective reference station/area mean concentration. Similarly, for temporal comparisons, the parameter concentration enrichment factor was calculated by dividing the 2020 mean parameter concentration at a mine-exposed station/area by the baseline (2005 to 2013 data) mean concentration. The resulting enrichment factors were qualitatively assigned as slightly, moderately, or highly elevated compared to reference and/or baseline conditions using the categorization described in Table 2.3.

**Table 2.3: Enrichment Factor Categories for Water and Sediment Chemistry Comparisons**

| Categories          | Enrichment Factor Criterion                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| Slightly elevated   | Concentration 3-fold to 5-fold higher at mine-exposed area versus the reference area or baseline data, as applicable.   |
| Moderately elevated | Concentration 5-fold to 10-fold higher at mine-exposed area versus the reference area or baseline data, as applicable.  |
| Highly elevated     | Concentration $\geq$ 10-fold higher at effluent-exposed area versus the reference area or baseline data, as applicable. |

Applicable WQG included the Canadian Water Quality Guidelines (CWQG; CCME 1999, 2019) or, for parameters with no CWQG, the most conservative (i.e., lowest) criterion available from established Ontario Provincial Water Quality Objectives (PWQO; OMOEE 1994) or British Columbia Water Quality Guidelines (BCWQG; BCMOE 2006, 2019). Water quality guidelines are abbreviated simply as 'WQG' in this report, although it is recognized that in certain cases the values presented may represent water quality 'objectives'. For WQGs that are hardness dependent, the hardness of the individual sample was used to calculate the WQG for the specific parameter according to established formulae (Table 2.2). Water chemistry data were also compared to site-specific water quality benchmarks developed for the Mary River Project AEMP (Intrinsik 2014). The AEMP water chemistry benchmarks were derived using an evaluation of background (i.e., baseline) water chemistry data together with existing generic WQGs that consider aquatic toxicity thresholds. These benchmarks were developed to inform management decisions under the AEMP assessment approach and management response framework (Baffinland 2015). An elevation in concentration of a parameter above the respective AEMP benchmark may trigger various actions (e.g., sampling design modifications, additional statistical assessment, considerations for mitigation, etc.) to better understand and potentially mitigate effects (Baffinland 2015). Water chemistry data for key parameters (i.e., parameters with AEMP benchmarks, or with concentrations that were higher at mine-exposed areas compared to reference areas) were plotted to evaluate changes in concentrations between baseline (2005 to 2013 data) and mine operational (2015 to 2020) years.



## **2.3 Sediment Quality**

### **2.3.1 General Design**

Sediment quality monitoring for the CREMP was designed to assess potential mine-related effects to the sediment of lake environments using a gradient-based approach (Baffinland 2015). Sediment quality sampling was conducted at five to ten stations per study lake for physical and chemical characterization as outlined under the CREMP, with additional characterization of physical sediment properties conducted at four to six stations per study lake to support the benthic invertebrate community analysis (Table 2.4; Figure 2.4). The lake sediment stations were designated as littoral or profundal based on a cut-off depth of 12 m, the value of which was used to define lake zonation during baseline characterization studies (KP 2014a, 2015). Sediment quality sampling was also conducted at three stations from each of the eight stream and five river study areas used to assess mine-related effects to benthic invertebrate communities (Table 2.5; Figure 2.4). Stream sediment sampling in the Camp Lake tributaries, Sheardown Lake tributaries, and Mary River is required every three years as outlined in the original CREMP design (KP 2014a; Baffinland 2015). All stream and river study areas were previously observed to contain limited depositional habitat and a general absence of substantial accumulation of fine sediments (KP 2015; Minnow 2016a,b, 2017, 2018). As a result, sediment sampling for chemical characterization was generally restricted to the shoreline and interstices of large, coarse substrate material (e.g., cobbles, boulders) within the applicable study areas. Similar to water quality, the evaluation of potential mine-related effects on sediments in Project area lakes focused on the use of established AEMP benchmarks to define Project-related effects.

### **2.3.2 Sample Collection and Laboratory Analysis**

Sediment at the study lakes was collected for physical and chemical characterization using a gravity corer (Hoskin Scientific Ltd., Model E-777-00) outfitted with a clean 5.1 cm inside-diameter polycarbonate tube. From each retrieved core sample containing an intact, representative sediment-water interface, the top two cm of sediment was manually extruded upwards into a graded core collar, sectioned with a stainless-steel core knife, and placed into a pre-labeled plastic sample bag. Samples from three to four cores treated in this manner were composited to create a single sample at each station. Supporting measurements of total core sample length and depths of visually apparent redox boundaries/horizons, as well as notes regarding sediment texture and colour for each visible horizon, general sediment odour (e.g., hydrogen sulphide), and presence of algae or plants on or in the sediment, were recorded for each core sample. Sediment from stream/river (erosional) habitats was collected for chemical characterization using a stainless-steel spoon. Sediment sampling from erosional habitats focused on locations containing the finest grain sizes available, including channel margins and downstream of large



**Table 2.4: Lake Sediment Quality and Benthic Invertebrate Community Monitoring Station Coordinates Used for the Mary River Project 2020 CREMP Study**

| Waterbody                     | Station Code  | UTM Zone 17W |          | Sampling Habitat | Sample Type                |                                    |                      |
|-------------------------------|---------------|--------------|----------|------------------|----------------------------|------------------------------------|----------------------|
|                               |               | Easting      | Northing |                  | Sediment Core <sup>a</sup> | Sediment petite-Ponar <sup>a</sup> | Benthic Invertebrate |
| Reference Lake 3              | REF-03-1      | 575889       | 7852752  | littoral         | ✓                          | -                                  | ✓                    |
|                               | REF-03-2      | 574200       | 7852330  | littoral         | ✓                          | -                                  | ✓                    |
|                               | REF-03-3      | 574564       | 7852840  | littoral         | ✓                          | -                                  | ✓                    |
|                               | REF-03-4      | 574301       | 7852705  | littoral         | ✓                          | -                                  | ✓                    |
|                               | REF-03-5      | 573694       | 7853613  | littoral         | ✓                          | -                                  | ✓                    |
|                               | REF-03-6      | 575411       | 7852766  | profundal        | ✓                          | -                                  | ✓                    |
|                               | REF-03-7      | 575076       | 7852750  | profundal        | ✓                          | -                                  | ✓                    |
|                               | REF-03-8      | 574445       | 7852992  | profundal        | ✓                          | -                                  | ✓                    |
|                               | REF-03-9      | 574168       | 7852975  | profundal        | ✓                          | -                                  | ✓                    |
|                               | REF-03-10     | 574358       | 7853400  | profundal        | ✓                          | -                                  | ✓                    |
| Camp Lake                     | JLO-02        | 557627       | 7914748  | littoral         | ✓                          | -                                  | ✓                    |
|                               | JLO-01        | 557092       | 7914370  | profundal        | ✓                          | -                                  | ✓                    |
|                               | JLO-14        | 557246       | 7914224  | profundal        | ✓                          | -                                  | -                    |
|                               | JLO-17        | 556900       | 7914594  | profundal        | ✓                          | -                                  | -                    |
|                               | JLO-21        | 556926       | 7914911  | littoral         | -                          | ✓                                  | ✓                    |
|                               | JLO-20        | 556750       | 7914850  | littoral         | -                          | ✓                                  | ✓                    |
|                               | JLO-19        | 556587       | 7914801  | littoral         | -                          | ✓                                  | ✓                    |
|                               | JLO-07        | 556803       | 7914095  | profundal        | ✓                          | -                                  | ✓                    |
|                               | JLO-18        | 556357       | 7914706  | littoral         | -                          | ✓                                  | ✓                    |
|                               | JLO-16        | 556335       | 7914470  | profundal        | ✓                          | -                                  | ✓                    |
|                               | JLO-15        | 556542       | 7914184  | profundal        | ✓                          | -                                  | -                    |
|                               | JLO-11        | 556594       | 7913946  | profundal        | ✓                          | -                                  | ✓                    |
|                               | JLO-13        | 556896       | 7913751  | profundal        | ✓                          | -                                  | -                    |
|                               | JLO-12        | 556378       | 7913728  | profundal        | ✓                          | -                                  | ✓                    |
| Sheardown Lake Northwest (NW) | DLO-01-5      | 559806       | 7913348  | profundal        | ✓                          | -                                  | ✓                    |
|                               | DLO-01-14     | 559821       | 7913328  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DLO-01-15     | 559884       | 7913340  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DD-HAB 9-STN2 | 560325       | 7913400  | littoral         | ✓                          | -                                  | -                    |
|                               | DLO-01-8      | 560338       | 7913192  | littoral         | ✓                          | -                                  | -                    |
|                               | DLO-01        | 560079       | 7913132  | profundal        | ✓                          | -                                  | -                    |
|                               | DLO-01-13     | 560151       | 7912997  | profundal        | ✓                          | -                                  | -                    |
|                               | DLO-01-2      | 560350       | 7912927  | profundal        | ✓                          | -                                  | ✓                    |
|                               | DLO-01-12     | 560339       | 7912852  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DLO-01-9      | 560746       | 7913076  | littoral         | ✓                          | -                                  | ✓                    |
|                               | DLO-01-4      | 560696       | 7913049  | littoral         | -                          | ✓                                  | ✓                    |
|                               | DLO-01-3      | 560471       | 7912838  | littoral         | -                          | ✓                                  | ✓                    |
|                               | DLO-01-11     | 560482       | 7912563  | littoral         | -                          | ✓                                  | ✓                    |
|                               | DLO-01-10     | 560570       | 7912566  | littoral         | ✓                          | -                                  | ✓                    |
| Sheardown Lake Southeast (SE) | DLO-02-1      | 560807       | 7912099  | littoral         | ✓                          | -                                  | ✓                    |
|                               | DLO-02-11     | 561585       | 7911799  | littoral         | ✓                          | -                                  | ✓                    |
|                               | DLO-02-10     | 561602       | 7911821  | littoral         | -                          | ✓                                  | ✓                    |
|                               | DLO-02-4      | 561512       | 7911833  | littoral         | ✓                          | -                                  | ✓                    |
|                               | DLO-02-12     | 561433       | 7911905  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DLO-02-9      | 561414       | 7911806  | littoral         | -                          | ✓                                  | ✓                    |
|                               | DLO-02-8      | 561300       | 7911839  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DLO-02-13     | 561222       | 7911958  | profundal        | -                          | ✓                                  | ✓                    |
|                               | DLO-02-2      | 561161       | 7911858  | profundal        | ✓                          | -                                  | ✓                    |
|                               | DLO-02-3      | 561039       | 7911898  | profundal        | ✓                          | -                                  | ✓                    |
| Mary Lake                     | BLO-01        | 554690       | 7913186  | littoral         | ✓                          | -                                  | ✓                    |
|                               | BLO-16        | 553289       | 7908092  | profundal        | ✓                          | -                                  | -                    |
|                               | BLO-03        | 552679       | 7906660  | profundal        | ✓                          | -                                  | ✓                    |
|                               | BLO-15        | 552723       | 7906419  | profundal        | -                          | ✓                                  | ✓                    |
|                               | BLO-14        | 552688       | 7905282  | profundal        | ✓                          | -                                  | ✓                    |
|                               | BLO-05        | 554635       | 7906033  | profundal        | -                          | ✓                                  | ✓                    |
|                               | BLO-11        | 554942       | 7906033  | littoral         | -                          | ✓                                  | ✓                    |
|                               | BLO-12        | 554644       | 7905742  | profundal        | ✓                          | -                                  | -                    |
|                               | BLO-13        | 553879       | 7905094  | profundal        | -                          | ✓                                  | ✓                    |
|                               | BLO-04        | 553820       | 7904893  | profundal        | ✓                          | -                                  | ✓                    |
|                               | BLO-10        | 555033       | 7905065  | profundal        | ✓                          | -                                  | -                    |
|                               | BLO-09        | 554707       | 7904486  | profundal        | ✓                          | -                                  | -                    |
|                               | BLO-08        | 555424       | 7904239  | profundal        | ✓                          | -                                  | -                    |
|                               | BLO-07        | 555767       | 7903583  | littoral         | -                          | ✓                                  | ✓                    |
|                               | BLO-06        | 555925       | 7903771  | littoral         | ✓                          | -                                  | ✓                    |

<sup>a</sup> Sediment core samples analyzed for particle size, TOC and total metals. Petite-ponar sediment grab samples analyzed for particle size only.



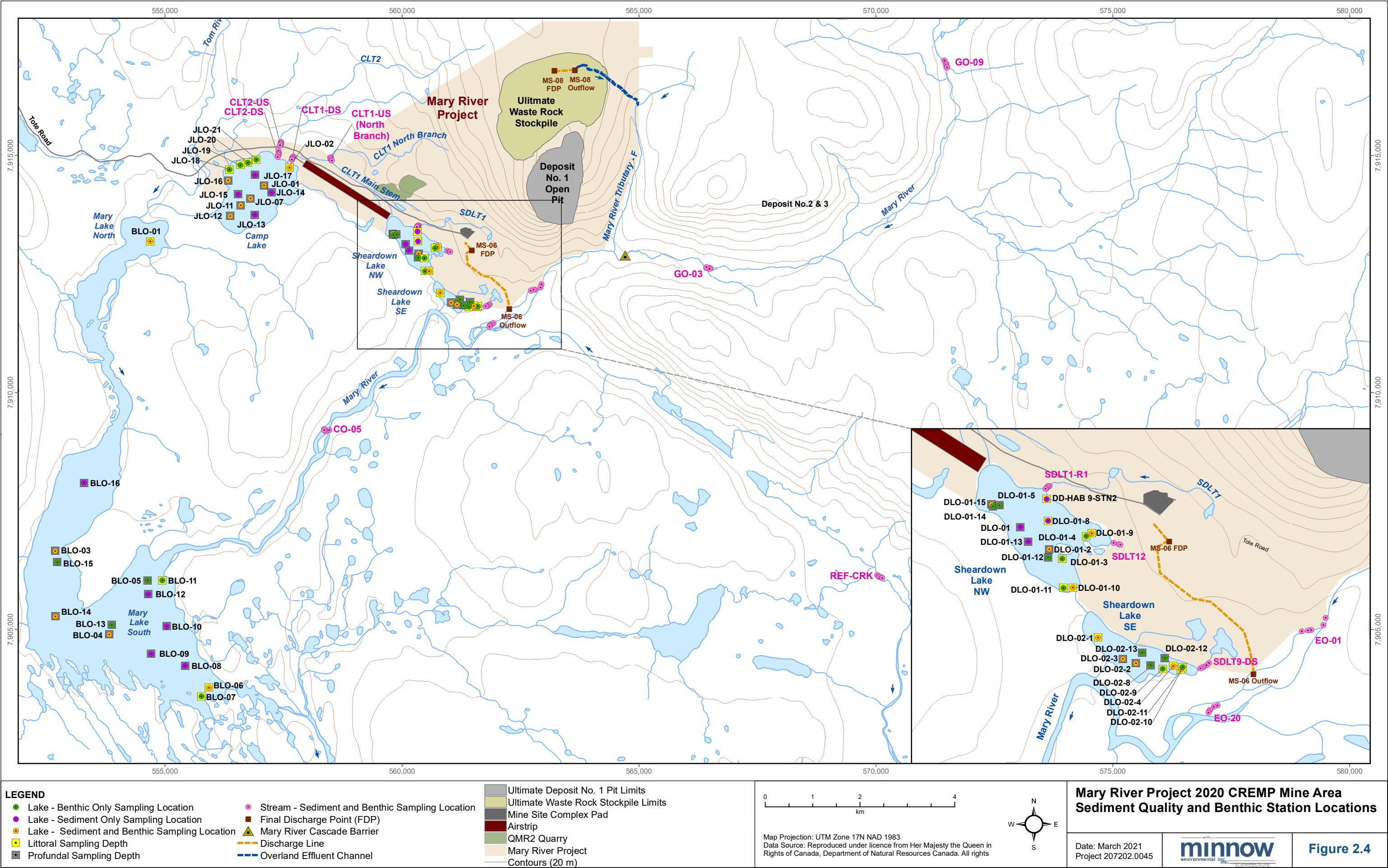


**Table 2.5: Stream and River Sediment and Benthic Invertebrate Community Monitoring Station Identifiers and Coordinates Used for the Mary River Project CREMP 2020 Study**

| Lake System                   | Waterbody                            | Station Code | Station Type         | UTM Zone 17W, NAD83 |          | Sediment Sample | Benthic Invertebrate |
|-------------------------------|--------------------------------------|--------------|----------------------|---------------------|----------|-----------------|----------------------|
|                               |                                      |              |                      | Easting             | Northing |                 |                      |
| Angajurjualuk Lake            | Unnamed Tributary                    | REF-CRK-B1   | Reference            | 570025              | 7906148  | ✓               | ✓                    |
|                               |                                      | REF-CRK-B2   | Reference            | 570060              | 7906115  | -               | ✓                    |
|                               |                                      | REF-CRK-B3   | Reference            | 570093              | 7906110  | ✓               | ✓                    |
|                               |                                      | REF-CRK-B4   | Reference            | 570121              | 7906099  | -               | ✓                    |
|                               |                                      | REF-CRK-B5   | Reference            | 570137              | 7906086  | ✓               | ✓                    |
| Camp Lake                     | Camp Lake Tributary 1                | CLT1-US-B1   | Lightly Mine-Exposed | 558502              | 7914967  | ✓               | ✓                    |
|                               |                                      | CLT1-US-B2   | Lightly Mine-Exposed | 558488              | 7914963  | -               | ✓                    |
|                               |                                      | CLT1-US-B3   | Lightly Mine-Exposed | 558494              | 7914930  | ✓               | ✓                    |
|                               |                                      | CLT1-US-B4   | Lightly Mine-Exposed | 558509              | 7914903  | -               | ✓                    |
|                               |                                      | CLT1-US-B5   | Lightly Mine-Exposed | 558517              | 7914890  | ✓               | ✓                    |
|                               |                                      | CLT1-DS-B1   | Mine-Exposed         | 557710              | 7914978  | ✓               | ✓                    |
|                               |                                      | CLT1-DS-B2   | Mine-Exposed         | 557693              | 7914957  | -               | ✓                    |
|                               |                                      | CLT1-DS-B3   | Mine-Exposed         | 557686              | 7914944  | ✓               | ✓                    |
|                               |                                      | CLT1-DS-B4   | Mine-Exposed         | 557678              | 7914932  | -               | ✓                    |
|                               |                                      | CLT1-DS-B5   | Mine-Exposed         | 557672              | 7914917  | ✓               | ✓                    |
|                               | Camp Lake Tributary 2                | CLT2-US-B1   | Lightly Mine-Exposed | 557441              | 7915291  | ✓               | ✓                    |
|                               |                                      | CLT2-US-B2   | Lightly Mine-Exposed | 557451              | 7915275  | -               | ✓                    |
|                               |                                      | CLT2-US-B3   | Lightly Mine-Exposed | 557450              | 7915251  | ✓               | ✓                    |
|                               |                                      | CLT2-US-B4   | Lightly Mine-Exposed | 557441              | 7915237  | -               | ✓                    |
|                               |                                      | CLT2-US-B5   | Lightly Mine-Exposed | 557423              | 7915215  | ✓               | ✓                    |
|                               |                                      | CLT2-DS-B1   | Mine-Exposed         | 557392              | 7915104  | ✓               | ✓                    |
|                               |                                      | CLT2-DS-B2   | Mine-Exposed         | 557398              | 7915053  | -               | ✓                    |
|                               |                                      | CLT2-DS-B3   | Mine-Exposed         | 557400              | 7915032  | ✓               | ✓                    |
|                               |                                      | CLT2-DS-B4   | Mine-Exposed         | 557997              | 7915008  | -               | ✓                    |
|                               |                                      | CLT2-DS-B5   | Mine-Exposed         | 557377              | 7914971  | ✓               | ✓                    |
| Sheardown Lake Northwest (NW) | Sheardown Lake Tributary 1 (Reach 1) | SDLT1-R1-B1  | Mine-Exposed         | 560352              | 7913522  | ✓               | ✓                    |
|                               |                                      | SDLT1-R1-B2  | Mine-Exposed         | 560338              | 7913520  | -               | ✓                    |
|                               |                                      | SDLT1-R1-B3  | Mine-Exposed         | 560328              | 7913507  | ✓               | ✓                    |
|                               |                                      | SDLT1-R1-B4  | Mine-Exposed         | 560320              | 7913497  | -               | ✓                    |
|                               |                                      | SDLT1-R1-B5  | Mine-Exposed         | 560313              | 7913493  | ✓               | ✓                    |
|                               | Sheardown Lake Tributary 12          | SDLT12-B1    | Mine-Exposed         | 560953              | 7912988  | ✓               | ✓                    |
|                               |                                      | SDLT12-B2    | Mine-Exposed         | 561003              | 7912975  | ✓               | ✓                    |
|                               |                                      | SDLT12-B3    | Mine-Exposed         | 561016              | 7912971  | ✓               | ✓                    |
| Sheardown Lake Southeast (SE) | Sheardown Lake Tributary 9           | SDLT9-DS-B1  | Mine-Exposed         | 561848              | 7911860  | ✓               | ✓                    |
|                               |                                      | SDLT9-DS-B2  | Mine-Exposed         | 561825              | 7911838  | -               | ✓                    |
|                               |                                      | SDLT9-DS-B3  | Mine-Exposed         | 561798              | 7911824  | ✓               | ✓                    |
|                               |                                      | SDLT9-DS-B4  | Mine-Exposed         | 561785              | 7911816  | -               | ✓                    |
|                               |                                      | SDLT9-DS-B5  | Mine-Exposed         | 561767              | 7911812  | ✓               | ✓                    |
| Mary Lake                     | Mary River                           | GO-09-B1     | Reference            | 571447              | 7917010  | ✓               | ✓                    |
|                               |                                      | GO-09-B2     | Reference            | 571479              | 7916946  | -               | ✓                    |
|                               |                                      | GO-09-B3     | Reference            | 571489              | 7916919  | ✓               | ✓                    |
|                               |                                      | GO-09-B4     | Reference            | 571499              | 7916883  | -               | ✓                    |
|                               |                                      | GO-09-B5     | Reference            | 571503              | 7916858  | ✓               | ✓                    |
|                               |                                      | GO-03-B1     | Mine-Exposed         | 566489              | 7912626  | ✓               | ✓                    |
|                               |                                      | GO-03-B2     | Mine-Exposed         | 566509              | 7912616  | -               | ✓                    |
|                               |                                      | GO-03-B3     | Mine-Exposed         | 566491              | 7912605  | ✓               | ✓                    |
|                               |                                      | GO-03-B4     | Mine-Exposed         | 566425              | 7912630  | -               | ✓                    |
|                               |                                      | GO-03-B5     | Mine-Exposed         | 566425              | 7912642  | ✓               | ✓                    |
|                               |                                      | EO-01-B1     | Mine-Exposed         | 562944              | 7912281  | ✓               | ✓                    |
|                               |                                      | EO-01-B2     | Mine-Exposed         | 562922              | 7912214  | -               | ✓                    |
|                               |                                      | EO-01-B3     | Mine-Exposed         | 562806              | 7912171  | ✓               | ✓                    |
|                               |                                      | EO-01-B4     | Mine-Exposed         | 562778              | 7912165  | -               | ✓                    |
|                               |                                      | EO-01-B5     | Mine-Exposed         | 562717              | 7912158  | ✓               | ✓                    |
|                               |                                      | EO-20-B1     | Mine-Exposed         | 561930              | 7911460  | ✓               | ✓                    |
|                               |                                      | EO-20-B2     | Mine-Exposed         | 561895              | 7911447  | -               | ✓                    |
|                               |                                      | EO-20-B3     | Mine-Exposed         | 561858              | 7911420  | ✓               | ✓                    |
|                               |                                      | EO-20-B4     | Mine-Exposed         | 561848              | 7911408  | -               | ✓                    |
|                               |                                      | EO-20-B5     | Mine-Exposed         | 561841              | 7911393  | ✓               | ✓                    |
|                               |                                      | CO-05-B1     | Mine-Exposed         | 558465              | 7909208  | ✓               | ✓                    |
|                               |                                      | CO-05-B2     | Mine-Exposed         | 558387              | 7909183  | -               | ✓                    |
|                               |                                      | CO-05-B3     | Mine-Exposed         | 558365              | 7909214  | ✓               | ✓                    |
|                               |                                      | CO-05-B4     | Mine-Exposed         | 558355              | 7909224  | -               | ✓                    |
|                               |                                      | CO-05-B5     | Mine-Exposed         | 558359              | 7909209  | ✓               | ✓                    |

boulders within the active channel. One sample, representing a composite of a variable number of spoonfuls, was collected directly into a pre-labelled plastic sample bag at each station. Following collection, all sediment samples were placed into a cooler, transported to the mine, and stored under cool conditions until shipment to the analytical laboratory.

Upon completion of the field program, sediment samples were shipped to ALS (Waterloo, ON) for analysis using standard laboratory methods. Physical characterization of samples included percent moisture and particle size analyses, and chemical characterization included analyses of TOC and total metals (including mercury).

### 2.3.3 Data Analysis

Sediment quality data from the mine-exposed lakes, creeks, and rivers were compared to like-habitat reference area data, applicable sediment quality guidelines/AEMP benchmarks and, when available, baseline sediment quality data. Sediment physical characteristics (i.e., moisture, particle size) and TOC data collected at study area lakes were summarized based on calculation of mean, standard deviation, standard error, minima, and maxima for littoral and profundal habitat. The data from the mine-exposed lakes were compared to the reference lake data using the same statistical tests, data transformations, test assumptions, and statistical software described previously for the statistical evaluation of *in situ* water quality (see Section 2.2.3).

The sediment chemistry data from the mine-exposed lakes were initially assessed to identify potential gradients in metal concentrations with distance from known or suspected sources of mine-related deposits to the lake. For each mine-exposed lake, creek, or river study area, data for each sediment chemistry parameter were separately averaged for each habitat type (e.g., littoral and profundal habitat in lakes) and then compared between like-habitat mine-exposed and reference areas using enrichment factors calculated and compared as described previously for evaluation of water chemistry (Section 2.2.3; Table 2.3). Sediment chemistry data collected at lake environments were compared to applicable Canadian Sediment Quality Guidelines (CSQG; CCME 1999) probable effect levels (PEL) or, for parameters with no CSQG, to Ontario Provincial Sediment Quality Guidelines (PSQG; OMOE 1993) severe effect levels (SEL), collectively referred to as 'SQG' throughout this document. The 2020 lake sediment chemistry data analyses included comparisons to Mary River Project AEMP sediment quality benchmarks that were derived using baseline sediment chemistry data for each mine-exposed lake and existing generic CSQG interim or PSQG lowest effect level sediment quality guidelines (Intrinsik 2014, 2015). As indicated previously, the AEMP benchmarks were developed to inform management decisions under the AEMP assessment approach and management response framework (Baffinland 2015). An increase in concentration above the



AEMP benchmark may trigger various actions to better understand and potentially mitigate effects (Baffinland 2015).

Sediment chemistry data for key parameters (i.e., parameters with concentrations that were notably higher at mine-exposed areas compared to the reference area, that have been identified as site-specific parameters of concern in previous studies, and/or those with concentrations above SQG and/or AEMP benchmarks) were plotted to evaluate potential changes in concentrations from 2020 relative to baseline (2005 to 2013) and earlier in the period of mine operation (2015 to 2019). In addition, as described previously, enrichment factors were calculated between the 2020 and baseline data for each individual study lake using the same calculation (and categorization description) as described previously (Section 2.2.3; Table 2.3).

The applicability of lotic sediment chemistry data to the interpretation of lotic benthic invertebrate community data was considered minimal given the fact that fine sediment composes much less than 5% of available substrate at the lotic environments (extrapolation of the data suggests that silt and clay compose less than 0.5% of available habitat) and that benthic invertebrates collected for the CREMP do not inhabit these fine sediments. By extension, because fish species inhabiting lotic environments largely rely on benthic invertebrates as a food source, the applicability of sediment chemistry monitoring data to understanding effects on fish was also considered minimal. Because sufficient amounts of fine sediment were able to be collected at only 3 of 23 lotic stations during the baseline period (KP 2014a,b), no temporal comparison of the stream/river sediment chemistry data was conducted.

## **2.4 Biological Assessment**

### **2.4.1 Phytoplankton**

The CREMP uses measures of aqueous chlorophyll-a concentrations to assess potential mine-related influences on phytoplankton. Because chlorophyll-a is the primary pigment of phytoplankton (i.e., algae and other photosynthetic microbiota suspended in the water column), aqueous chlorophyll-a concentrations are often used as a surrogate for evaluating the amount of photosynthetic microbiota in aquatic environments (Wetzel 2001). Chlorophyll-a samples were collected by Baffinland environmental department staff at the same stations and same time, using the same methods and equipment, as described for the collection of water chemistry samples (Table 2.1; Figures 2.2 and 2.3; Section 2.2.3). The chlorophyll-a samples were collected into 1 L glass amber bottles and maintained in a cool and dark environment prior to submission to ALS (Mary River On-Site Laboratory, NU). On the same day of collection, the on-site laboratory filtered the samples through a 0.45 micron cellulose acetate membrane filter assisted by a vacuum pump. Following filtration, the membrane filter was wrapped in aluminum foil, inserted into a labelled





envelope, and then frozen. At the completion of field collections for the seasonal sampling event, the filters were shipped frozen to ALS in Waterloo, ON for chlorophyll-a analysis using standard methods. The field QA/QC applied during chlorophyll-a sampling was similar to that described for water chemistry sampling (see Section 2.2.3).

The CREMP study design also stipulates the collection of phytoplankton community samples for archiving (Baffinland 2015). If water quality, chlorophyll-a, and/or other biological components indicate potential mine-related effects on primary productivity at a specific mine-exposed waterbody, the phytoplankton community samples may be processed to further investigate the nature of potential mine-related effects on phytoplankton biomass and community structure (e.g., taxonomic composition, richness, density). To date, none of the archived phytoplankton community samples have been processed (2006 to 2019). In 2020, phytoplankton community samples were collected using the same methods described in the CREMP (Baffinland 2015) and, as in the past, these samples were not processed, but were archived for potential future use.

The analysis of aqueous chlorophyll-a concentrations closely mirrored the approach used to evaluate the water quality data. Chlorophyll-a concentrations were compared: i) between respective mine-exposed and reference areas; ii) spatially and seasonally at each mine-exposed waterbody; iii) to AEMP benchmarks; and, iv) to baseline data. Comparisons of chlorophyll-a concentrations between the mine-exposed and reference areas were based on both qualitative and statistical approaches, the latter of which was based on the same statistical tests, data transformations, test assumptions, statistical software, and alpha (p-value) for defining differences as described previously for statistical analysis of *in situ* water quality data (Section 2.2.2). An AEMP benchmark chlorophyll-a concentration of 3.7 µg/L was established for the Mary River Project (Baffinland 2015). The 2020 chlorophyll-a concentration data were compared to this benchmark to assist with the determination of potential mine-related enrichment effects at waterbodies influenced by mine operations. A mine-related effect on the productivity of a waterbody was defined as a chlorophyll-a concentration above the AEMP benchmark, the concentration measured in a representative reference area, and/or the respective waterbody baseline condition.

## **2.4.2 Benthic Invertebrate Community**

### **2.4.2.1 General Design**

The CREMP benthic invertebrate community (benthic) survey design outlines a habitat-based approach for characterizing potential mine-related effects to benthic biota of lotic (stream/river) and lentic (lake) environments (Baffinland 2015). Lotic areas sampled for benthic invertebrates included Camp Lake Tributaries 1 and 2 at historically established areas located upstream and

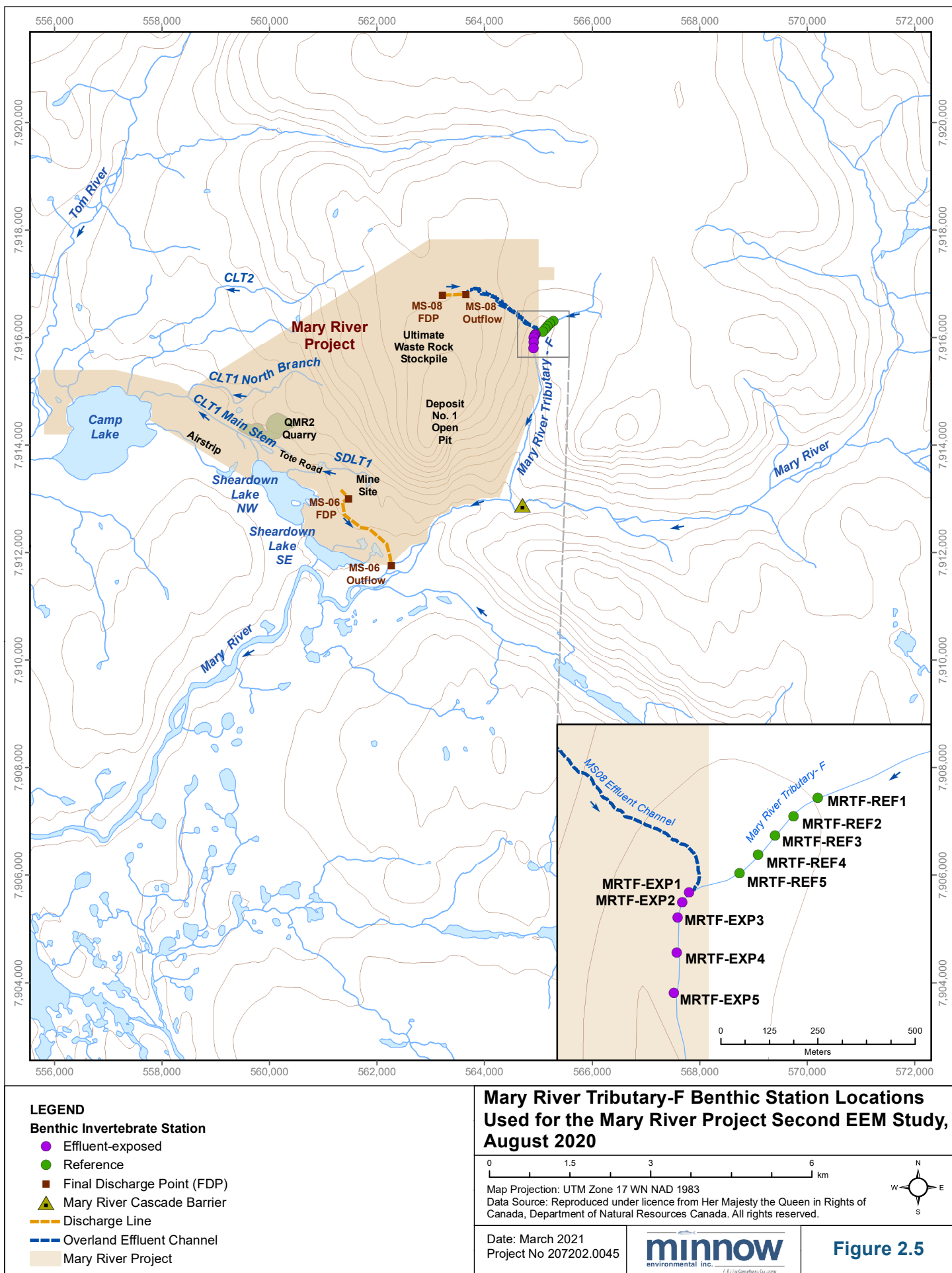




downstream of the Milne Inlet Tote Road, Sheardown Lake Tributaries 1, 9, and 12 near their respective outlets, and Mary River upstream (two areas) and downstream (three areas) of the Mine Site (Table 2.5; Figure 2.4). Benthic samples were also collected at a reference creek located within the same unnamed tributary to Angajurjualuk Lake that is used for reference water quality sampling (Stations CLT-REF4 and MRY-REF2) as part of the 2020 CREMP to augment the original study design (Table 2.5; Figure 2.4). This reference creek, referred to as Unnamed Reference Creek herein, was initially sampled as part of the benthic invertebrate community assessment in the 2016 CREMP (see Minnow 2017). Environmental Effects Monitoring (EEM) benthic invertebrate community data collected at an unnamed tributary to Mary River (referred to as Mary River Tributary-F [MRTF]) downstream (effluent-exposed) and upstream (reference) of the primary mine effluent discharge have also been included in this CREMP report to consolidate all available benthic information for the mine receiving environment (Figure 2.5). Consistent with the federal EEM program, the CREMP incorporated sampling at five benthic stations at each lotic study area except for Sheardown Lake Tributary 12, where only three stations were sampled due to limited habitat available for sampling using conventional gear suitable for erosional habitat. As in studies conducted from 2015 to 2019, the level of replication used for lotic benthic sampling in 2020 was greater than specified under the original CREMP design to provide consistency with EEM standards (Minnow 2016a). To the extent possible, the same station locations used in previous studies were sampled in 2020 to provide continuity among historical baseline and recent studies.

In lentic environments, benthic sampling was conducted at the 40 previously established stations described in the CREMP study design among the four mine-exposed study lakes (i.e., ten stations in each of Camp, Sheardown NW, Sheardown SE and Mary lakes), as well as at the same ten stations established at Reference Lake 3 during the 2015 study (Table 2.4; Figures 2.3 and 2.4). Analysis of benthic data collected at Reference Lake 3 from 2015 to 2019 indicated that, similar to temperate lakes (Ward 1992), depth-related influences on benthic invertebrate community structure (e.g., density and richness) occur naturally in lakes of the study region (Minnow 2016a, 2017, 2018, 2019, 2020). Analysis of benthic data collected from Reference Lake 3 in 2020 provided on-going confirmation of the occurrence of natural depth-related influences on benthic invertebrate community structure in area lakes (Appendix B). Because of the occurrence of natural depth-related differences in benthic invertebrate communities, the benthic stations at each mine-exposed and reference lake were categorized as littoral zone (2-12 m depth) or profundal zone (>12 m depth) stations based on station depth (Table 2.4). To the extent possible, five littoral and five profundal stations were designated for each study lake





based on the previously established suite of CREMP lentic benthic stations<sup>3</sup> to provide temporal continuity with the baseline studies and the original CREMP design (Table 2.4; Figure 2.4), as well as to allow data analysis in accordance with EEM standards. The sampling of five stations from each zone at each study area ensured adequate statistical power to detect ecologically meaningful differences in benthic metrics of  $\pm$  two standard deviations (SDs) of a comparable reference area mean using an equal  $\alpha$  and  $\beta$  of 0.10 (Environment Canada 2012).

#### 2.4.2.2 Sample Collection and Laboratory Analysis

Two types of equipment and methods were used during the 2020 CREMP benthic survey to sample the different types of habitat encountered as follows:

- at **lotic (stream/river) stations** (i.e., predominantly cobble and/or gravel substrate in flowing waters), benthic samples were collected using a Surber sampler (0.0929 m<sup>2</sup> sampling area) outfitted with 500- $\mu$ m mesh. At each erosional station, one sample representing a composite of three Surber sampler grabs (i.e., 0.279 m<sup>2</sup> area) was collected to ensure adequate representation of the habitat. A concerted effort was made to ensure that water velocity and substrate characteristics were comparable among respective mine-exposed and reference study area stations to minimize natural influences on community variability. Once all three sub-samples were collected at each station, all material gathered in the Surber sampler net was transferred to a plastic sampling jar which was labelled with both an external and internal station identifier.
- at **lentic (lake) stations** (i.e., predominantly soft silt-sand, silt, and/or clay substrates with variable amounts of organics), benthic sampling was conducted using a petite-Ponar grab sampler (15.24 x 15.24 cm; 0.023 m<sup>2</sup> sampling area). A single sample, consisting of a composite of five grabs (i.e., 0.115 m<sup>2</sup> sampling area) was collected at each station with care taken to ensure that each grab was acceptable (i.e., that the grab captured sufficient surface material and was full to each edge). Incomplete grabs were discarded. For each acceptable grab, the petite-Ponar was thoroughly rinsed and the material then field-sieved through 500- $\mu$ m mesh. Following sieving of all five grabs, the retained material was carefully transferred into a plastic sampling jar which was labelled with both an external and internal station identifier.

Following collection, benthic samples were preserved to a level of 10% buffered formalin in ambient water. Supporting measurements and information collected at each replicate grab

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<sup>3</sup> At Sheardown Lake SE, depths greater than 12 m are spatially limited, and thus the five deepest CREMP stations were designated as profundal despite one of the five being less than 12 m deep. At Mary Lake, six of the CREMP stations occurred at depths greater than 12 m and thus were all designated as profundal, with the four remaining stations designated as littoral.



location for lotic stations included sampling depth, water velocity, and description of aquatic vegetation/algae presence. In addition, *in situ* water quality at the bottom of the water column and collection/recording of global positioning system (GPS) coordinates was conducted at each lotic benthic station. Supporting information recorded at each lake benthic station included substrate description, presence of aquatic vegetation/algae, sampling depth, *in situ* water quality near the water column surface and bottom, and GPS coordinates. All GPS coordinates were collected in Universal Transverse Mercator (UTM) units using a hand-held portable Garmin GPS72 (Garmin International Inc., Olathe, KS) device based on 1983 North American Datum (NAD 83).

Benthic samples were submitted to and processed by Zeas Inc. (Nobleton, ON) using standard sorting methods. Upon arrival at the laboratory, a biological stain was added to each benthic sample to facilitate greater sorting accuracy. The samples were washed free of formalin in a 500 µm sieve and the remaining sample material was examined under a stereomicroscope at a magnification of at least ten times by a technician. Benthic invertebrates were removed from the sample debris and placed into vials containing 70% ethanol according to major taxonomic groups (i.e., order or family levels). A senior taxonomist later enumerated and identified the benthic organisms to the lowest practical level (typically genus or species) utilizing up-to-date taxonomic keys. The QA/QC conducted during the laboratory processing of benthic samples included organism recovery and sub-sampling checks on as many as 10% of the total samples collected for the 2020 CREMP (Appendix A).

#### **2.4.2.3 Data Analysis**

Benthic data were evaluated separately for lotic, lentic littoral, and lentic profundal habitat data sets. Benthic invertebrate communities were evaluated using summary metrics of mean invertebrate abundance (or “density”; average number of organisms per m<sup>2</sup>), mean taxonomic richness (number of taxa, as identified to lowest practical level), Simpson’s Evenness Index, and the Bray-Curtis Index of Dissimilarity. Simpson’s Evenness was calculated using the Krebs method (Smith and Wilson 1996). Additional comparisons were conducted using percent composition of dominant/indicator taxa, functional feeding groups (FFG), and habit preference groups (HPG; percent composition of taxa and groups were calculated as the abundance of each respective group relative to the total number of organisms in the sample). Dominant/indicator taxonomic groups were defined as those groups representing, on average, greater than 5% of total organism abundance for a study area or any groups considered important indicators of environmental stress. The FFG and HPG were assigned based on Pennak (1989), Mandaville (2002), and/or Merritt et al. (2008) descriptions/designations for each taxon.



Statistical comparisons of benthic invertebrate community metrics and community composition endpoints, with the exception of Bray-Curtis Index, were conducted using the same tests described for the *in situ* water quality comparisons (see Section 2.2.2). Pair-wise differences between the mine-exposed and reference areas were preferentially tested using Student's t-tests on untransformed, normally distributed data. However, if data were determined to be non-normal, transformations including  $\log_{10}$  and  $\log_{10}(x+1)$  were applied to the data and evaluated for normality. The transformation that resulted in normal data with lowest skew and kurtosis values was then used for statistical testing using Student's t-tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U-tests were used for the pair-wise comparisons on rank transformation. Statistical comparisons were conducted using R programming (R Foundation for Statistical Computing, Vienna, Austria). An effect on benthic invertebrate communities was defined as a significant difference between any paired mine-exposed and reference areas at a p-value of 0.10. For each endpoint that differed significantly, a magnitude of difference was calculated between study area means. Because the benthic survey was designed to have sufficient power to detect a difference (effect size) of  $\pm$  two SD, the magnitude of the difference was calculated to reflect the number of reference mean standard deviations ( $SD_{REF}$ ) using equations provided by Environment Canada (2012). A Critical Effect Size for the benthic invertebrate community study ( $CES_{BIC}$ ) of  $\pm 2 SD_{REF}$  was used to define ecologically relevant 'effects', which is analogous to differences beyond those expected to occur naturally between two areas that are uninfluenced by anthropogenic inputs (i.e., between pristine reference areas; see Munkittrick et al. 2009; Environment Canada 2012).

The Bray-Curtis Index was used to evaluate community level differences between study areas, and was computed and assessed statistically using procedures recommended for federal EEM studies (i.e., Borcard and Legendre 2013). Specifically, community level differences between study areas were assessed in a pairwise fashion using  $\ln$ -transformed abundance data, and with homogeneity of group variance calculated according to the PERMDISP2 procedure provided by Anderson (2006). A Mantel Test and distance-based Redundancy Analysis (dbRDA) was then used to determine potential differences in community structure between study areas using R statistical software (as per Borcard and Legendre 2013).

Temporal comparisons included statistical evaluations among the baseline and 2015 to 2020 data for primary benthic metrics (i.e., density, richness, Simpson's Evenness), dominant invertebrate groups, and FFG using univariate tests (e.g., ANOVA) and pair-wise *post hoc* tests. The temporal statistical comparisons were conducted using the same tests, transformations, assumptions, and software described above for the *in situ* water quality comparisons based on a multiple group analysis (see Section 2.2.2). Tukey's HSD *post hoc* tests were used in instances where normal data showed equal variance, and Tamhane's *post hoc* tests were used in instances where





normal data showed unequal variance (for the multiple group temporal comparisons). Similar to the 2020 within-year statistical analyses, the magnitude of difference was calculated for endpoints that differed significantly between years in the *post hoc* tests, which was then compared to the benthic survey  $CES_{BIC}$  of within SDs of the baseline year mean (abbreviated as  $\pm 2 SD_{BL-year}$ ).

### 2.4.3 Fish Population

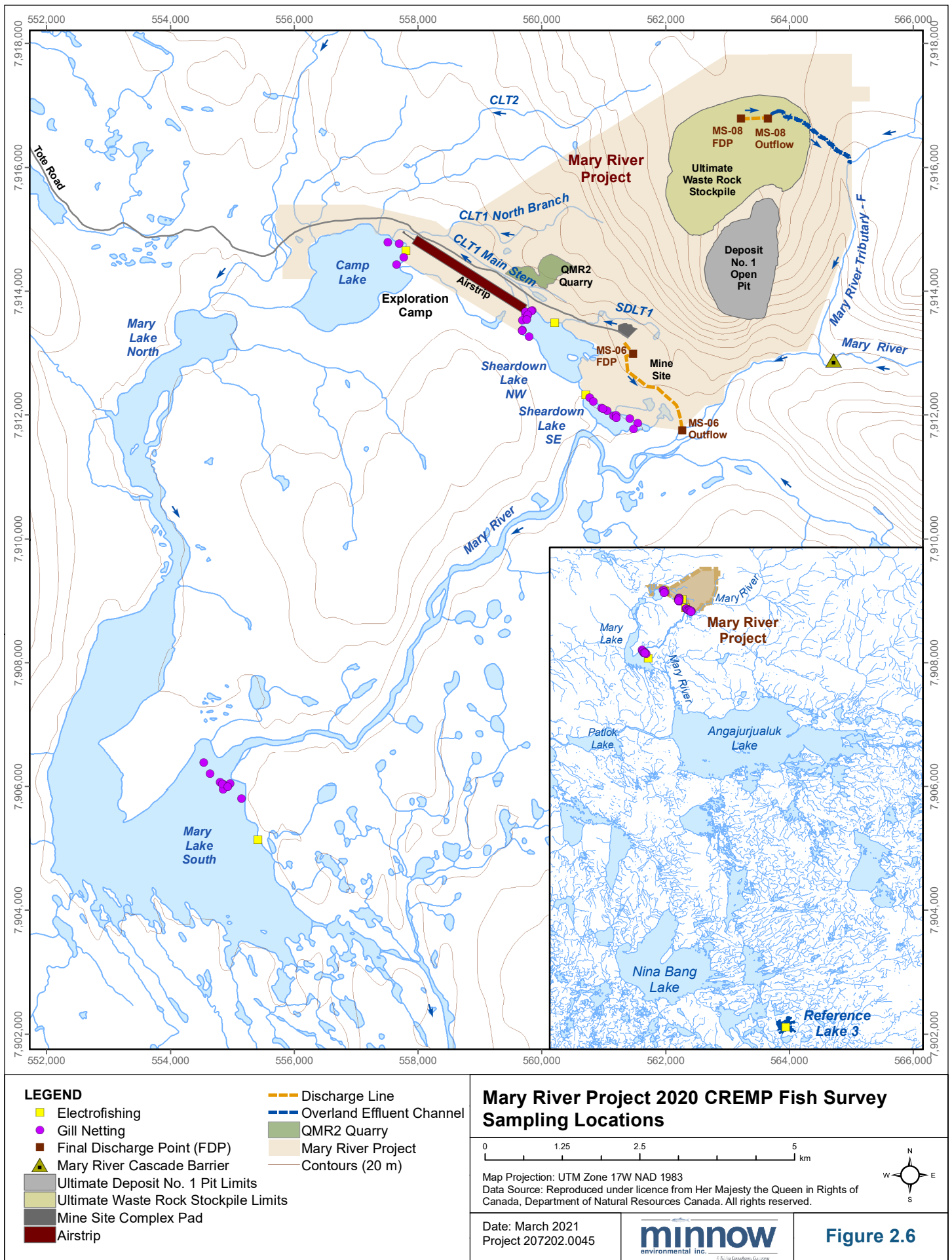
#### 2.4.3.1 General Design

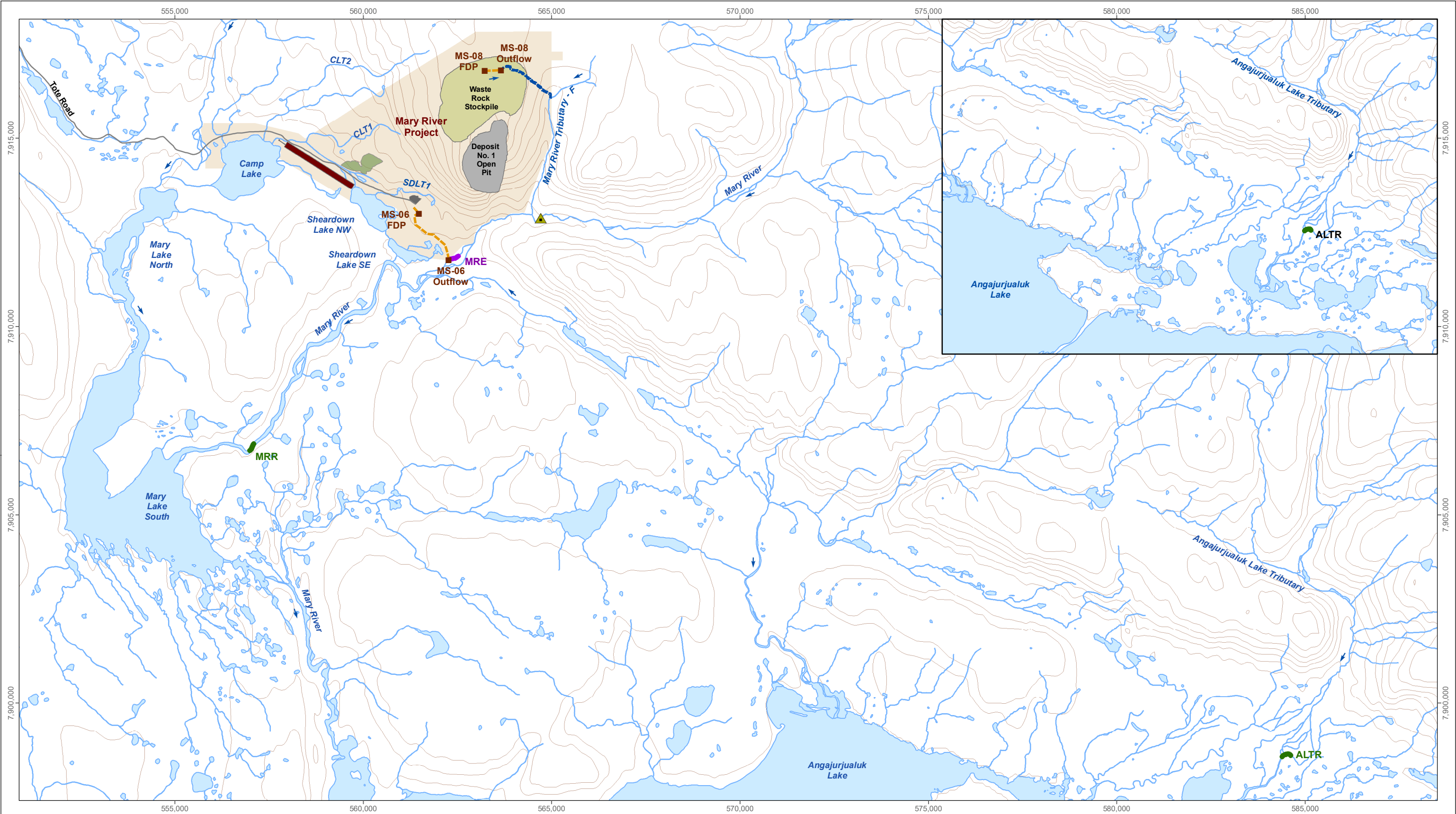
The CREMP fish population survey outlines a non-lethal sampling design to evaluate potential mine-related effects on the fish population (e.g., age structure, condition) at the mine-exposed lakes (Baffinland 2015). The fish population survey targeted arctic charr (*Salvelinus alpinus*) primarily because this species is the most abundant in the mine's regional lakes and sufficient baseline catch and measurement data exist to allow application of a before-after statistical evaluation. Arctic charr are also important as an Inuit subsistence food source. The approach employed for the CREMP fish population survey closely mirrored the recommended EEM approach for non-lethal sampling (Environment Canada 2012). Specifically, the fish population survey targeted the collection of approximately 100 arctic charr from nearshore lake habitat and 100 arctic charr from littoral/profundal lake habitat. The four mine-exposed study lakes used for the fish population survey were the same as those used to document baseline conditions, namely Camp, Sheardown NW, Sheardown SE, and Mary lakes (Figure 2.6). Unlike CREMP studies conducted from 2015 to 2017, enough arctic charr were captured at Reference Lake 3 nearshore and littoral/profundal areas to allow statistical evaluation of potential health effects on arctic charr populations at the mine-exposed lakes. Therefore, the 2020 CREMP fish population survey included separate comparisons of arctic charr collected at nearshore and littoral/profundal habitats between the mine-exposed lakes and reference lake, as well as comparisons of fish from nearshore and littoral/profundal zones of individual mine-exposed lakes before and after the commencement of the Mary River Project commercial mine operations. In addition to the CREMP data, EEM fish population survey and fish tissue data collected from Mary River near- and far-field mine-exposed areas, as well as an unnamed tributary to Angajurjualuk Lake in 2020 (Figure 2.7; Minnow 2020) have been summarized in this CREMP report to consolidate all available fish population information applicable to the mine receiving environment.

#### 2.4.3.2 Sample Collection

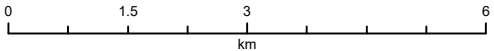
Nearshore areas of study lakes used for the CREMP study and streams/rivers used for the EEM study were sampled for arctic charr using a battery powered backpack electrofishing unit (Model LR-24, Smith-Root Inc., Vancouver, WA). An electrofishing team, consisting of the



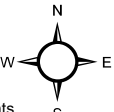




- LEGEND**
- |                                      |                                      |                    |
|--------------------------------------|--------------------------------------|--------------------|
| <b>Fish Survey Sampling Location</b> | QMR2 Quarry                          | Mary River Project |
| Effluent-Exposed                     | Ultimate Deposit No. 1 Pit Limits    | Contours (20 m)    |
| Reference                            | Ultimate Waste Rock Stockpile Limits | Tote Road          |
| Discharge Line                       | Mine Site Complex Pad                |                    |
| Final Discharge Point (FDP)          | Airstrip                             |                    |



Map Projection: UTM Zone 17 W NAD 1983  
Data Source: Reproduced under licence from Her Majesty the Queen in Rights of Canada, Department of Natural Resources Canada. All rights reserved.



**Fish Survey Sampling Locations for the Mary River Project Second EEM, August 2020**

Date: March 2021  
Project 207202.0045



**Figure 2.7**



backpack electrofisher operator and a single netter, conducted a single fishing pass at up to two shoreline reaches of each study lake and each lotic study area (Figure 2.6). The number of passes conducted at each lake/lotic study area was dependent upon catch success, with an additional pass required in instances where target sample numbers were not cumulatively attained. All fish captured during each pass were retained in buckets containing aerated water. At the conclusion of each pass, total fishing effort (i.e., electrofishing seconds) was recorded to allow calculation of time-standardized catch. All captured fish were identified to species and enumerated, following which any non-target species were released alive at the area of capture. All captured arctic charr were temporarily retained for processing using methods described in Section 2.4.3.3. For each electrofishing pass, GPS coordinates were recorded at the boundaries of each electrofishing reach.

Littoral/profundal areas of the study lakes were sampled for arctic charr using experimental (gang index) gill nets. Multiple-panel, 2 m high gill nets with total lengths ranging from 61 to 91 m (200' to 300') and bar mesh sizes ranging from 38 to 76 mm (1.5" to 3") were set on the bottom for short durations (range from 0.5 to 2.9 hours per set; average of 1.4 hours) during daylight hours. Upon retrieval of each net, all captured fish were identified to species, enumerated, and processed (see below) separately for each individual gill net panel mesh size. For each gill net set, information including mesh size, duration of sampling, and GPS coordinates were recorded.

#### **2.4.3.3 Field and Laboratory Processing**

Following completion of each electrofishing pass and retrieval of each individual gill net panel, all captured arctic charr were subject to processing in the field. For all live captures, the external condition of each fish was assessed visually for the presence of any deformities, erosions, lesions, and tumors (DELT), in addition to evidence of external and/or internal parasites. All observations were recorded on field sheets, with supporting photographs taken as appropriate. Each fish was then subject to measurement of fork and total length to the nearest millimetre using a standard measuring board. Following length measurements, fish captured by electrofisher were individually weighed to the nearest milligram using an Ohaus Model 123 Scout-Pro analytical balance (Ohaus Corp., Pine Brook, NJ) with a surrounding draft shield. For arctic charr captured by gill net, individuals were weighed using Pesola™ spring scales (Pesola AG, Baar Switzerland) demarcated at intervals of 1 to 2% of the total scale range and providing accuracy of  $\pm 0.3\%$  of the fish mass. The Pesola™ spring scale for individual weight measurement of gill-net captured fish was selected so that the fish weight was near the top of the scale's range to ensure that measurements achieved a resolution near 1%. All live arctic charr that were not



selected for the collection of aging structures were released near the location of capture following measurements.

As specified for EEM non-lethal fish population surveys (see Environment Canada 2012), approximately 10% of the targeted number of arctic charr captured using electrofishing methods were sacrificed for collection of age structures. Otoliths were removed from all sacrificed individuals for age determination. Upon removal, otoliths were wrapped separately in wax paper, placed inside envelopes labelled with the fish identification, and then dried for storage. Otoliths were shipped to North Shore Environmental Services (NSES; Thunder Bay, ON) for age determination. At the laboratory, otoliths were prepared for aging using a “crack and burn” method. The prepared samples were mounted on a glass slide using a mounting medium and examined under a compound microscope using transmitted light to determine fish age. For each otolith, the age and edge condition were recorded along with a confidence rating for the age determination.

#### **2.4.3.4 Data Analysis**

Fish community data from the mine-exposed and reference study areas were compared based on total catch and catch-per-unit-effort (CPUE) for each sampling method. Electrofishing CPUE was calculated as the number of fish captured per electrofishing minute for each lake nearshore or lotic study area, and gill netting CPUE was calculated as the number of fish captured per 100 metre-hours of net used for each study lake. Temporal comparison of fish community assemblage was conducted qualitatively using electrofishing CPUE and gill netting CPUE to evaluate relative changes in fish catches at mine area lakes between mine baseline and individual years of mine operation from 2015 to 2020.

Arctic charr population health was assessed separately for electrofishing and experimental gill netting data sets. Initial data analysis included the plotting of length frequency distributions so that, together with appropriate age data, young-of-the-year (YOY) individuals could be distinguished from the older juvenile/adult life stages (electrofishing data set), or various size/age classes could be distinguished from one another (gill netting data set). Where sample sizes allowed, the YOY age class was assessed separately from the older juvenile/adult age classes for lake nearshore fish survey endpoints. Fish size endpoints of fork length and fresh body weight were summarized by separately reporting mean, median, minimum, maximum, standard deviation, standard error, and sample size by age class (if possible) for each study area. Measurement endpoints were used as the basis for evaluating four response categories (survival, growth, reproduction, and energy storage; Table 2.6) according to the procedures outlined for EEM by Environment Canada (2012). Length-frequency distributions were compared between the mine-exposed lakes and the reference lake or between lotic study areas using data





**Table 2.6: Fish Population Survey Endpoints Examined for the Mary River Project CREMP 2020 Study**

| Response Category         | Endpoint                                               | Statistical Procedure <sup>c,d,e</sup> | Critical Effect Size |
|---------------------------|--------------------------------------------------------|----------------------------------------|----------------------|
| Survival                  | Length-frequency distribution <sup>a</sup>             | K-S Test                               | not applicable       |
| Energy Use (size)         | Size (fresh body weight) <sup>b</sup>                  | ANOVA                                  | 25%                  |
|                           | Size (fork length) <sup>b</sup>                        | ANOVA                                  | 25%                  |
| Energy Use (reproduction) | Relative abundance of YOY (% composition) <sup>b</sup> | K-S Test                               | not applicable       |
| Energy Storage            | Condition (body weight against length) <sup>a</sup>    | ANCOVA                                 | 10%                  |

<sup>a</sup> Endpoints used for determining "effects" as designated by statistically significant difference between mine-exposed and reference areas (Environment Canada 2012).

<sup>b</sup> These analyses are for informational purposes and significant differences between exposure and reference areas are not necessarily used to designate an effect (Environment Canada 2012).

<sup>c</sup> ANOVA (Analysis of Variance) used except for non-normal data, where Mann Whitney U-tests were used.

<sup>d</sup> ANCOVA (Analysis of Covariance). For the ANCOVA analyses, the first term in parentheses is the endpoint (dependent variable Y) that is analyzed for an effluent effect. The second term in parentheses is the covariate, X (age, weight, or length).

<sup>e</sup> K-S Test (Kolmogorov-Smirnov test).

collected in 2020, and between the combined baseline period and 2020 for individual lakes (i.e., before-after analysis), using a non-parametric two-sample Kolmogorov-Smirnov (KS) test. Potential differences in reproductive success between paired study areas were based on evaluation of the relative proportion of arctic charr YOY between the mine-exposed and reference areas, and by comparing the results of KS tests conducted with and without YOY individuals included in the data sets.

Mean fork length and body weight were compared between mine-exposed and reference study areas using data collected in 2020, and between the mine baseline period and 2020. Data were evaluated for normality and homogeneity of variance before applying parametric statistical tests such as ANOVA. In cases where data did not meet the assumptions of ANOVA despite log-transformation, a non-parametric Mann-Whitney U-test was used to test for differences between study areas or study periods. Body weight at fork length (condition) was compared using Analysis-of-Covariance (ANCOVA). Prior to conducting the ANCOVA tests, scatter plots of all variable and covariate combinations were examined to identify outliers, leverage values, or other unusual data. The scatter plots were also examined to ensure that there was adequate overlap between the 2020 mine-exposed and reference area data, or between the 2020 mine-exposed and baseline data, and that there was a linear relationship between the variable and the covariate. To verify the existence of a linear relationship, each relationship was tested using linear regression analysis by area and evaluated at an alpha level of 0.05. If it was determined that there was no significant linear regression relationship between the variable and covariate for the 2020 mine-exposed area and the reference data or mine-exposed area baseline data, then the ANCOVA was not performed.

Once it was determined that ANCOVA could be used for statistical analysis, the first step in the ANCOVA was to test whether the slopes of the regression lines between data sets were equal. This was accomplished by including an interaction term (dependent  $\times$  covariate) in the ANCOVA model and evaluating if the interaction term was significantly different, in which case the regression slopes would not be equal between data sets and the resulting ANCOVA would provide spurious results. In such cases, the options considered to determine if a full ANCOVA could proceed included 1) removal of influential points using Cook's distance and re-assessment of equality of slopes; and/or, 2) Coefficients of Determination that considered slopes equal regardless of an interaction effect (Environment Canada 2012). For the Coefficients of Determination, the full ANCOVA was completed to test for main effects, and if the  $r^2$  value of both the parallel regression model (interaction term) and full regression model were greater than 0.8 and within 0.02 units in value, the full ANCOVA model was considered valid (Environment Canada 2012). If both methods proved unacceptable, a statistically significant interaction effect (slopes are not equal) was noted, and the magnitude of effect was estimated at



both the minimum and maximum overlap of covariate variables between areas (Environment Canada 2012). If the interaction term was not significant (i.e., homogeneous slopes between the two populations), then the full ANCOVA model was run without the interaction term to test for differences in adjusted means between the two data sets. The adjusted mean was then used as an estimate of the population mean based on the value of the covariate in the ANCOVA model.

For endpoints showing significant differences, the magnitude of difference between 2020 mine-exposed and reference data or between 2020 and baseline data was calculated as described by Environment Canada (2012) using mean (ANOVA), adjusted mean (ANCOVA with no significant interaction), or predicted values (ANCOVA with significant interaction). The anti-log of the mean, adjusted mean, or predicted value was used in the equations for endpoints that were  $\log_{10}$ -transformed. If there was no significant difference between data sets, the minimum detectable effect size was calculated as a percent difference from the reference mean/mine-exposed baseline mean for ANOVA or adjusted reference mean/mine-exposed baseline mean for ANCOVA at  $\alpha = \beta = 0.10$  using the square root of the mean square error (generated during either the ANOVA or ANCOVA procedures) as a measure of variability in the sample population based on formula provided by Environment Canada (2012). Finally, if outliers or leverage values were observed in a data set (or sets) upon examination of scatter plots and residuals, then the values were removed and ANOVA or ANCOVA tests were repeated and presented for both the complete and reduced data sets. Similar to the CES applied to the benthic invertebrate community survey, a magnitude of difference of  $\pm 10\%$  was applied for condition (CES<sub>C</sub>), to define ecologically relevant differences consistent with those recommended for EEM (Table 2.6; Munkittrick et al. 2009; Environment Canada 2012).

Finally, an *a priori* power analysis was completed to determine appropriate fish sample sizes for future surveys as recommended by Environment Canada (2012). These analyses were completed based on the mean square error values generated during the ANOVA or ANCOVA procedures and were calculated with  $\alpha$  and  $\beta$  set equally at 0.10. Two main assumptions served as the basis for the power analysis. The first assumption was that the fish caught in each of the mine-exposed and reference areas in 2020, or at mine-exposed areas in 2020 and baseline, were representative of the population at large (i.e., similar distribution and variance with respect to the parameters examined). The second assumption was that the characteristics of the populations would not change substantially prior to the next study. The power analysis results were reported as the minimum sample size (number of fish/area) required to detect a given magnitude of difference (effect size) between the mine-exposed and reference area/baseline populations for each endpoint. The magnitude of difference was presented as a percentage decrease or increase of the reference area/baseline mean for each endpoint as measured during

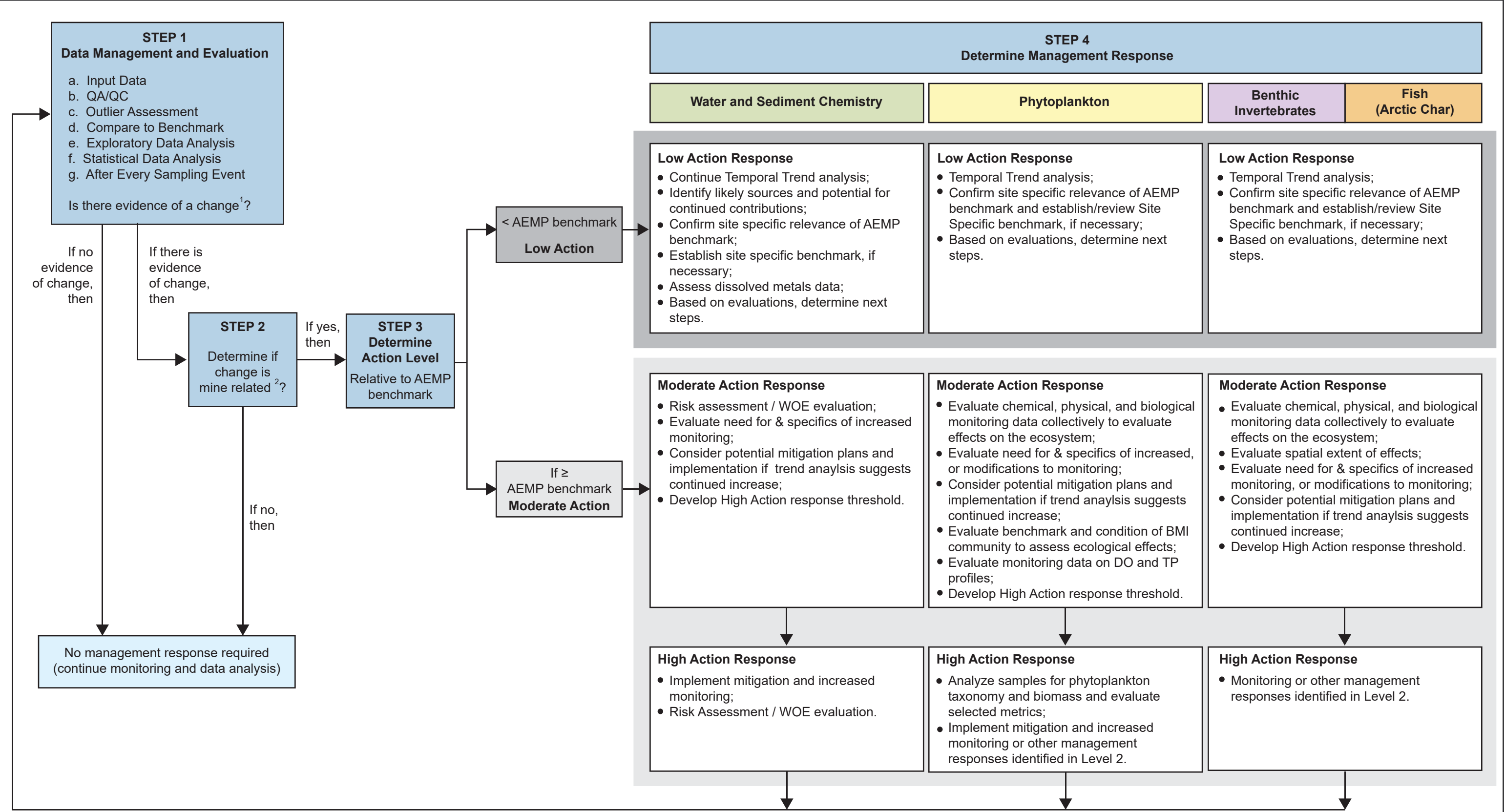


the fish population study using the observed pooled standard deviation of the residuals from ANOVA or parallel slope ANCOVA model.

## 2.5 Effects Assessment

The objective of the Mary River Project 2020 CREMP was to evaluate potential mine-related influences on chemical and biological conditions at aquatic environments located near the mine following the sixth full year of mine operation. The 2020 CREMP incorporated an effects-based approach that included standard EEM techniques to provide rigorous evaluation of potential mine-related effects at key waterbodies that receive mine-related deposits from various mine effluents, surface runoff, and aerial deposition of dust originating from mine operations. Under this approach, water quality and sediment quality data were used to support the interpretation of phytoplankton, benthic invertebrate community, and fish population survey data collected at mine-exposed areas of the Camp Lake, Sheardown Lake, Mary River, and Mary Lake systems. The evaluation of potential mine-related effects within these systems was based upon comparisons of the 2020 data to applicable reference data, to available baseline data, and to guidelines that included site-specific AEMP benchmarks. The latter were developed to guide management response decisions within a four-step Assessment Approach and Management Response Framework as outlined in the Mary River Project AEMP (Figure 2.8; Baffinland 2015). An effects determination was conducted for all key waterbodies located within each of the Camp Lake, Sheardown Lake, Mary River, and Mary Lake systems which included summarization of instances in which the Mary River Project AEMP benchmarks for water quality and sediment quality were exceeded at waterbodies examined under the CREMP. Based on weight-of-evidence that considered incidences in which the AEMP benchmarks were exceeded and corroboration of adverse influences on aquatic biota based on the results of biological monitoring, the effects determination identified potential biological effects at these waterbodies in 2020 and, where appropriate, provided recommendation(s) for future study to assist Baffinland with decisions regarding appropriate management actions.





Notes:

1. Statistical or qualitative change when compared to:
  - a) benchmark,
  - b) baseline values,
  - c) temporal or spatial trends
2. Mine related changes are a result of the mine and associated facilities including but not limited to effects from effluent discharges and dust deposition that are distinguished from natural causes or variation.

**Baffinland Mary River Project AEMP Data Assessment Approach and Response Framework**

Date: March 2021  
Project 207202.0045



**Figure 2.8**



## 3 CAMP LAKE SYSTEM

### 3.1 Camp Lake Tributary 1 (CLT1)

#### 3.1.1 Water Quality

Camp Lake Tributary 1 (CLT1) dissolved oxygen was consistently near full saturation at the north branch and main stem stations during all spring, summer, and fall monitoring events, and were comparable to, or slightly higher than, concentrations at the reference creeks (Appendix Tables C.1 to C.3; Figure 3.1). In addition, dissolved oxygen concentrations at CLT1 north branch and lower main stem stations were above the WQG lowest acceptable concentration for early life stages of cold-water biota (i.e., 9.5 mg/L) at the time of biological sampling in August 2020 (Figure 3.1; Appendix Table C.12). No consistent spatial patterns in pH were shown with progression downstream through the CLT1 north branch (Stations L1-08 to L1-02) and main stem (Stations L2-03 to L0-01) stations for each of the spring, summer, and fall monitoring events (Appendix Tables C.1 to C.3). Although pH was significantly higher at CLT1 compared to Unnamed Reference Creek during the fall sampling event in August 2020, the pH at all CLT1 stations was consistently within WQG limits in 2020 in all spring, summer, and fall sampling events (Figure 3.1; Appendix Tables C.1 to C.3). No significant difference in pH was indicated between CLT1 north branch and lower main stem in August 2020, indicating no substantial influence of the Milne Inlet Tote Road on in-stream pH (Figure 3.1; Appendix Table C.12).

Specific conductance at CLT1 was generally highest in the upper main stem (Station L2-03) and lowest in the north branch (Stations L1-02 and L1-08), with intermediate values observed at the lower main stem stations reflecting mixing of these two branches and suggesting a potential mine-related source affecting water quality of the CLT1 upper main stem (Appendix Tables C.1 to C.3, and C.12). Specific conductance was consistently higher at CLT1 compared to the reference creek stations over the spring, summer, and fall sampling events in 2020 (Appendix Tables C.1 to C.3, and C.13), and was also significantly higher at CLT1 compared to Unnamed Reference Creek during the August 2020 biological study (Figure 3.1). No significant difference in specific conductance was indicated between the CLT1 north branch and lower main stem in August 2020 (Appendix Table C.12), suggesting that the source of elevated specific conductance was unrelated to the Milne Inlet Tote Road but rather was associated with the upper portion of the CLT1 system.

At the CLT1 north branch stations (L1-08 and L1-02), water chemistry met AEMP benchmarks and WQG in 2020 except for copper concentrations, which were elevated relative to one or both criteria during the spring, summer, and fall sampling events (Table 3.1; Appendix Table C.14). However, like most parameters, copper concentrations at the CLT1 north branch were not



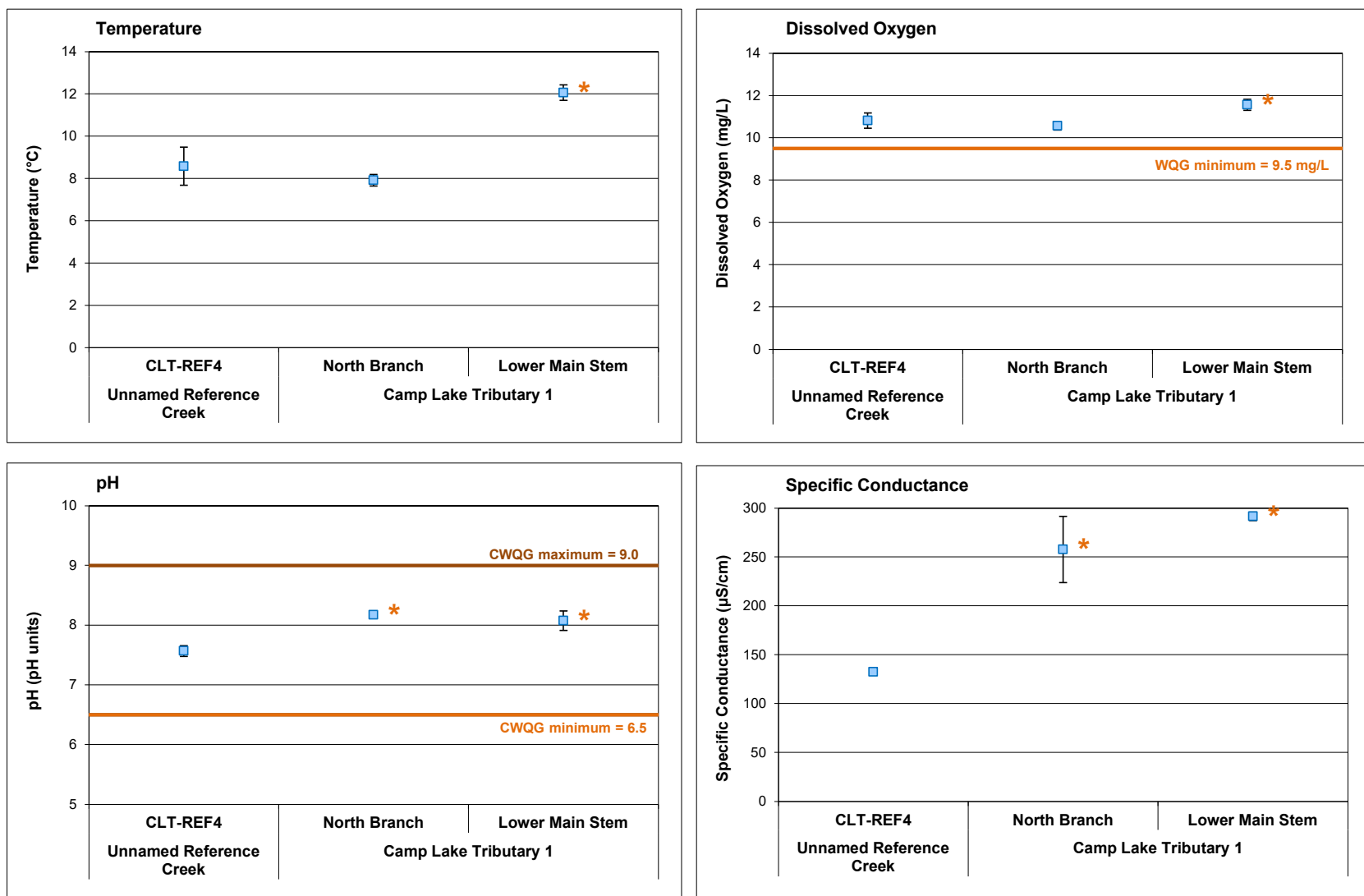


**Figure 3.1: Comparison of In Situ Water Quality Variables (mean  $\pm$  SD; n = 5) Measured at Camp Lake Tributary 1 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: An asterisk (\*) next to data point indicates mean value differs significantly from the Unnamed Reference Creek mean.

Table 3.1: Mean Water Chemistry at Camp Lake Tributary 1 (CLT1) Monitoring Stations During Spring, Summer, and Fall, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Reference Creeks (n=4) |               |          | North Branch |                |          | Upper Main Stem (L2-03) |                |                | Lower Main Stem |          |          |
|---------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|------------------------|---------------|----------|--------------|----------------|----------|-------------------------|----------------|----------------|-----------------|----------|----------|
|                           |                                    |         |                                            |                             | Spring                 | Summer        | Fall     | Spring       | Summer         | Fall     | Spring                  | Summer         | Fall           | Spring          | Summer   | Fall     |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                           | 55                     | 134           | 175      | 111          | 192            | 216      | 258                     | 393            | 449            | 155             | 282      | 300      |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.63                   | 8.01          | 8.05     | 8.04         | 8.14           | 8.14     | 8.16                    | 8.01           | 8.11           | 8.19            | 8.23     | 8.23     |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 23.6                   | 57.05         | 82.6     | 52.2         | 90.5           | 112.5    | 103                     | 147            | 191            | 70              | 128      | 149      |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 3.2                    | 2.7           | 2        | 2.35         | 2              | 2        | 9.9                     | <2.0           | <2.0           | 2.2             | 2.0      | 2.0      |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 85                     | 85            | 99       | 86           | 101            | 54       | 158                     | 191            | 236            | 110             | 132      | 110      |
|                           | Turbidity                          | NTU     | -                                          | -                           | 1.87                   | 6.62          | 2.49     | 1.21         | 0.19           | 0.18     | 15.80                   | 2.38           | 2.62           | 2.31            | 0.79     | 0.88     |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 24                     | 61            | 69       | 53           | 94             | 101      | 93                      | 138            | 156            | 69              | 122      | 133      |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.01                   | 0.01225       | 0.01     | 0.01         | 0.01           | 0.016    | 0.064                   | 0.024          | 0.036          | 0.010           | 0.010    | 0.013    |
|                           | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                  | 0.062         | 0.076    | 0.051        | 0.074          | 0.075    | 1.03                    | 1.520          | 1.710          | 0.149           | 0.280    | 0.350    |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                  | 0.005         | 0.005    | 0.005        | 0.005          | 0.005    | 0.0089                  | 0.0099         | 0.0124         | 0.005           | 0.005    | 0.005    |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.02                   | 0.15          | 0.15     | 0.05         | 0.15           | 0.15     | 1.04                    | 0.32           | 0.54           | 0.15            | 0.16     | 0.18     |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.93                   | 3.44          | 2.31     | 2.65         | 3.01           | 2.51     | 4.79                    | 6.01           | 8.00           | 3.41            | 4.76     | 3.79     |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.23                   | 3.05          | 2.14     | 3.50         | 3.85           | 2.86     | 5.87                    | 7.48           | 6.86           | 4.68            | 5.51     | 4.08     |
|                           | Total Phosphorus                   | mg/L    | 0.030 <sup>α</sup>                         | -                           | 0.0045                 | 0.0065        | 0.0039   | 0.0037       | 0.0030         | 0.003    | 0.0197                  | 0.0093         | <0.0030        | 0.0082          | 0.0031   | 0.0030   |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | 0.0010                 | 0.0010        | 0.0021   | 0.0010       | 0.0013         | 0.0010   | <0.0010                 | 0.0012         | 0.0018         | 0.0010          | 0.0010   | 0.0013   |
|                           | Bromide (Br)                       | -       | -                                          | -                           | 0.10                   | 0.1           | 0.1      | 0.1          | 0.1            | 0.1      | <0.10                   | <0.10          | <0.10          | 0.1             | 0.1      | 0.1      |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.2                    | 4.07          | 7.09     | 1.42         | 3.01           | 4.53     | 16.4                    | 27.70          | 34.4           | 4.4             | 11.2     | 14.7     |
| Total Metals              | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 1.31                   | 5.52          | 9.25     | 2.57         | 5.17           | 7.25     | 8.22                    | 16.40          | 19.60          | 3.48            | 7.97     | 11.13    |
|                           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                       | 0.0775                 | <b>0.3106</b> | 0.0593   | 0.0194       | 0.0087         | 0.0080   | <b>0.2700</b>           | 0.0495         | 0.0979         | 0.0566          | 0.0154   | 0.0124   |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | 0.0001                 | 0.0001        | 0.0001   | 0.0001       | 0.0001         | 0.0001   | <0.00010                | <0.00010       | <0.00010       | 0.0001          | 0.0001   | 0.0001   |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.00010                | 0.00013       | 0.00010  | 0.00010      | 0.00010        | 0.00010  | 0.00018                 | 0.00015        | 0.00014        | 0.00010         | 0.00010  | 0.00010  |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00362                | 0.00948       | 0.01031  | 0.00758      | 0.01215        | 0.01365  | 0.01240                 | 0.01510        | 0.01800        | 0.00889         | 0.01470  | 0.01620  |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -                           | 0.0005                 | 0.0004        | 0.0005   | 0.0005       | 0.0005         | 0.0005   | <0.00050                | <0.00050       | <0.00050       | 0.0005          | 0.0005   | 0.0005   |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                 | 0.0003875     | 0.0005   | 0.0005       | 0.0005         | 0.0005   | <0.00050                | <0.00050       | <0.00050       | 0.0005          | 0.0005   | 0.0005   |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                   | 0.01          | 0.01     | 0.010        | 0.010          | 0.010    | 0.017                   | 0.025          | 0.023          | 0.010           | 0.012    | 0.012    |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                     | 0.00001                | 0.00001       | 0.00001  | 0.00001      | 0.00001        | 0.00001  | <0.000010               | <0.000010      | <0.000010      | 0.00001         | 0.00001  | 0.00001  |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                           | 4.9                    | 11.8          | 16.5     | 10.2         | 17.8           | 21.8     | 20.6                    | 29.4           | 35.7           | 14.1            | 25.3     | 28.1     |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00050                | 0.00082       | 0.00050  | 0.00050      | 0.00050        | 0.00050  | 0.00059                 | <0.00050       | <0.00050       | 0.00050         | 0.00050  | 0.00050  |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.0040                      | 0.00010                | 0.00016       | 0.00010  | 0.00010      | 0.00010        | 0.00010  | 0.00027                 | 0.00019        | 0.00024        | 0.00010         | 0.00010  | 0.00010  |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                      | 0.00071                | 0.00115       | 0.00102  | 0.00206      | <b>0.00222</b> | 0.00216  | 0.00164                 | 0.00134        | 0.00159        | 0.00185         | 0.00194  | 0.00196  |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.077                  | 0.2425        | 0.06625  | 0.030        | 0.030          | 0.030    | <b>0.420</b>            | <b>0.423</b>   | <b>0.522</b>   | 0.080           | 0.123    | 0.100    |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000107               | 0.000226      | 0.000092 | 0.000053     | 0.000050       | 0.000050 | 0.000987                | 0.000092       | 0.000222       | 0.000102        | 0.000050 | 0.000050 |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                 | 0.0011        | 0.0010   | 0.0010       | 0.0013         | 0.0013   | 0.0033                  | 0.0042         | 0.0042         | 0.0015          | 0.0026   | 0.0026   |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 2.86                   | 6.7           | 9.6      | 6.4          | 11.2           | 13.9     | 13.1                    | 19.1           | 24.2           | 8.8             | 15.7     | 18.2     |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00136                | 0.00300       | 0.00102  | 0.00078      | 0.00063        | 0.00061  | 0.01970                 | 0.03230        | 0.03820        | 0.00338         | 0.00846  | 0.00766  |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.0000050              | 0.000005      | 0.000005 | 0.000005     | 0.000005       | 0.000005 | <0.0000050              | <0.0000050     | <0.0000050     | 0.000005        | 0.000005 | 0.000005 |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00015                | 0.00045       | 0.00057  | 0.00050      | 0.00116        | 0.00127  | 0.00199                 | 0.00361        | 0.00385        | 0.00073         | 0.00132  | 0.00148  |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                | 0.00070       | 0.00057  | 0.00055      | 0.00057        | 0.00057  | 0.00711                 | 0.00139        | 0.00165        | 0.00082         | 0.00108  | 0.00100  |
|                           | Potassium (K)                      | mg/L    | -                                          | -                           | 0.45                   | 0.93          | 1.04     | 1.43         | 2.30           | 2.56     | 2.85                    | 4.05           | 4.40           | 1.67            | 2.64     | 2.80     |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.0010                 | 0.0007625     | 0.001    | 0.001        | 0.001          | 0.001    | <0.0010                 | <0.0010        | <0.0010        | 0.001           | 0.001    | 0.001    |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.62                   | 1.25          | 0.87     | 0.67         | 0.92           | 0.96     | 1.23                    | 0.94           | 1.08           | 0.80            | 1.12     | 1.11     |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.000010               | 0.00002       | 0.00001  | 0.00001      | 0.00001        | 0.00001  | <0.000010               | <0.000010      | <0.000010      | 0.00001         | 0.00001  | 0.00001  |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.83                   | 2.76          | 3.97     | 0.68         | 1.52           | 1.84     | 9.30                    | 16.00          | 19.00          | 2.43            | 5.82     | 7.00     |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00488                | 0.01391       | 0.01850  | 0.00630      | 0.01185        | 0.01465  | 0.02020                 | 0.03110        | 0.03850        | 0.01100         | 0.02310  | 0.02707  |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.00010                | 0.00008       | 0.00010  | 0.00010      | 0.00010        | 0.00010  | <0.00010                | <0.00010       | <0.00010       | 0.00010         | 0.00010  | 0.00010  |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.00010                | 0.0001        | 0.0001   | 0.0001       | 0.0001         | 0.0001   | <0.00010                | <0.00010       | <0.00010       | 0.0001          | 0.0001   | 0.0001   |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.011                  | 0.0241        | 0.0100   | 0.0100       | 0.0100         | 0.0100   | <0.010                  | <0.010         | <0.010         | 0.0100          | 0.0100   | 0.0100   |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00045                | 0.00405       | 0.00737  | 0.00091      | 0.00454        | 0.00781  | 0.01500                 | <b>0.02470</b> | <b>0.03320</b> | 0.00265         | 0.00736  | 0.01022  |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | 0.0010                 | 0.0012        | 0.0010   | 0.0010       | 0.0010         | 0.0010   | <0.0010                 | <0.0010        | <0.0010        | 0.0010          | 0.0010   | 0.0010   |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                 | 0.003         | 0.003    | 0.003        | 0.003          | 0.003    | 0.0034                  | <0.0030        | <0.0030        | 0.003           | 0.003    | 0.0030   |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake tributary system.

particularly elevated compared to the reference creek stations, with only total molybdenum and potassium concentrations showing slight elevation (i.e., 3- to 5-fold) at the CLT1 north branch but only during the spring sampling event in 2020 (Table 3.1; Appendix Tables C.14 and C.15). Total copper concentrations at the CLT1 north branch were, on average, higher in the spring of 2019 and 2020 compared to baseline, and in fall of all years of commercial mine production from 2015 to 2020 compared to baseline, but concentrations during summer were comparable between years of mine production from 2015 to 2020 and baseline (Appendix Figure C.2). Therefore, only a minor influence on water quality, reflected mainly by a slight elevation in copper concentrations, was indicated at the CLT1 north branch since commercial mine production commenced at the project in 2015.

At the CLT1 upper main stem (Station L2-03), mean concentrations of aluminum and iron were above their respective AEMP benchmarks in the spring sampling event and all spring, summer, and fall sampling events, respectively, in 2020 (Table 3.1). The total concentration of uranium was also elevated above WQG at the upper main stem in both summer and fall 2020 (Table 3.1). In addition to iron and uranium concentrations, chloride, nitrate, and total and dissolved manganese, molybdenum, and sodium concentrations were moderately (i.e., 5-fold to 10-fold) to highly (i.e.,  $\geq 10$ -fold) elevated at the CLT1 upper main stem compared to average concentrations at the reference creeks in two or more seasonal sampling events in 2020 (Table 3.1; Appendix Table C.15). Although total concentrations of aluminum and several other parameters were elevated at the CLT1 upper main stem during the spring sampling event compared to AEMP benchmarks and/or concentrations at the reference creeks, the elevation in these parameters appeared to be related to suspended minerals in the water column as indicated by elevated turbidity at the time of sampling (Appendix Table C.14).<sup>4</sup> In contrast, dissolved concentrations of iron, manganese, molybdenum, sodium, and uranium were moderately to highly elevated at the upper main stem in two or more seasonal sampling events in 2020, and thus elevations of these metals (and chloride and nitrate) appeared to reflect a mine-related source. Of those parameters with AEMP benchmarks, only iron, manganese, nitrate, and sulphate concentrations were elevated at the CLT1 upper main stem in 2020 compared to baseline, of which only the concentration of iron was above site-specific AEMP benchmarks (Appendix Figure C.2). Molybdenum and uranium concentrations, which do not have AEMP

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<sup>4</sup> Total aluminum and iron concentrations were also above AEMP benchmarks and/or WQG at the MRY-REF3 lotic reference station in 2020, where higher turbidity typically occurs compared to the other reference creek stations (Appendix Table B.2). This suggested natural elevation of these metals in regional watercourses as a result, in part, of naturally greater amount of mineral/particulate matter suspended in the water at this station. Evaluation of dissolved concentrations of aluminum showed similar average concentrations between CLT1 stations and the reference creek stations, corroborating that total aluminum concentrations were associated with turbidity and suggesting that mine operations were not a key source of aluminum to the system (Appendix Tables C.4, C.16, and C.17).



benchmarks, also showed elevated concentrations at the CLT1 upper main stem in 2020 compared to baseline (Appendix Figure C.2).

At the CLT1 lower main stem (Stations L1-09, L1-05, and L0-01), water chemistry met all AEMP benchmarks and WQG over the duration of spring, summer, and fall sampling events in 2020, including for copper and iron concentrations which were elevated above the AEMP benchmarks at the north branch and upper main stem, respectively (Table 3.1; Appendix Table C.14). Nevertheless, manganese, nitrate, and uranium concentrations were moderately elevated at the CLT1 lower main stem compared to the reference creeks in one of the three seasonal sampling events in 2020 (Appendix Table C.15). Of those parameters with AEMP benchmarks, only copper, nitrate, and sulphate showed elevated concentrations in 2020 compared to baseline at the lower main stem (Appendix Figure C.2), of which the elevation in copper likely reflected a north branch source. Similar to the upper main stem, molybdenum and uranium concentrations, which do not have applicable AEMP benchmarks, were also elevated at the CLT1 lower main stem in 2020 compared to baseline (Appendix Figure C.2).

Higher iron, manganese, molybdenum, nitrate, and uranium concentrations at the CLT1 main stem and/or lower stem stations following the initiation of commercial mine operation potentially reflected blasting/excavating activity (including associated dust generation) at the Mine Site QMR2 Quarry<sup>5</sup>, as well as fugitive dust generation from increased truck usage on the Milne Inlet Tote Road, compared to the baseline period. The relatively high concentrations of nitrate over years of mine operation at CLT1 were consistent with the deposition of explosives residue from blasting at the QMR2 Quarry as the source of these compounds. Concentrations of total molybdenum and uranium were highest at CLT1 main stem stations in 2019 and 2020 compared to all previous years of mine operation, but concentrations of these parameters generally remained well below WQG suggesting low potential for biological effects (Appendix Figure C.2). Overall, mine-related influences on water quality of the CLT1 were primarily reflected as elevated conductivity and concentrations of copper at the north branch, and elevated concentrations of nitrate, chloride, sulphate, and total metals including manganese, molybdenum, sodium, and uranium, at the upper main stem station. Despite elevation of parameter concentrations at the CLT1 north branch and upper main stem, none were elevated above applicable AEMP benchmarks or WQG at the lower main stem prior to discharge to Camp Lake.

### 3.1.2 Sediment Quality

In-stream substrate at CLT1 upstream (north branch; CLT1-US) and downstream (lower main stem; CLT1-DS) study areas was composed mainly of cobble material (i.e., substrate with

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<sup>5</sup> The QMR2 quarry is used to provide material for mine infrastructure projects (e.g., road construction).





diameters of 6 to 25 cm), with sand constituting only a trace amount (i.e., <1%) of the material observed at the sediment surface (Minnow 2018). Sediment sampled for chemistry analysis at both CLT1 study areas was predominantly composed of medium-sized coarse sand (Appendix Table D.7). The TOC content of the sampled sediment was generally low (i.e., <2%) at both CLT1 study areas, but was elevated (i.e., 7.5 and 13.5-fold higher at CLT1-US and CLT1-DS, respectively) compared to average lotic reference conditions suggesting a slightly more depositional environment at CLT1 (Table 3.2; Appendix Tables D.8 to D.10).

Metal concentrations in sediment from CLT1-US and CLT1-DS were generally elevated compared to those measured at lotic reference areas (Appendix Table D.10). This was particularly the case for aluminum, barium, copper, magnesium, manganese, molybdenum, nickel, potassium, and zinc, for which mean concentrations were five-fold or greater at one or both of CLT1-US and CLT1-DS compared to the average at reference areas (Table 3.2; Appendix Table D.10). Of these metals, only manganese, molybdenum, and potassium, together with uranium and zirconium, occurred at concentrations 1.5 times or greater at the downstream area compared to the upstream area (Table 3.2), potentially reflecting an influence of the Milne Inlet Tote Road or other mine sources on metal concentrations in sediment at CLT1-DS. Despite higher metal concentrations in sediment at CLT1-US and CLT1-DS compared to average lotic reference conditions, concentrations of all metals were well below applicable SQG at both CLT1 study areas (Table 3.2; Appendix Tables D.8 and D.9).

### 3.1.3 Phytoplankton

Chlorophyll-a concentrations at the upper-most CLT1 north branch station (Station L1-08) were lower than the mean concentration among reference creeks for spring, summer, and fall sampling events in 2020 (Figure 3.2). However, chlorophyll-a concentrations farther downstream within the north branch (i.e., Station L1-02) were generally comparable to chlorophyll-a concentrations at the reference creeks for all seasonal sampling events, suggesting no marked differences in phytoplankton abundance between the CLT1 north branch and the reference creek stations (Figure 3.2).

Within the CLT1 main stem, chlorophyll-a concentrations were generally highest at upstream-most Station L2-03 during spring, summer, and fall sampling events in 2020 (Figure 3.2). On average, chlorophyll-a concentrations were higher, but did not differ significantly, between the CLT1 main stem and reference creek stations during the spring and fall sampling events, but were significantly lower at the CLT1 main stem during the summer sampling event (Appendix Table E.2). Relatively high chlorophyll-a concentrations at Station L2-03 and in the CLT1 lower main stem during spring and summer sampling events potentially reflected higher nutrient (e.g., nitrate) concentrations compared to the reference creeks (Appendix Tables



**Table 3.2: Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 1 (CLT1) and Lotic Reference Area Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter       | Units | SQG <sup>a</sup>     | Lotic Reference Stations                |                                     | Camp Lake Tributary 1    |                            |
|-----------------|-------|----------------------|-----------------------------------------|-------------------------------------|--------------------------|----------------------------|
|                 |       |                      | Unnamed Reference Creek (REFCRK; n = 3) | Mary River Reference (GO-09; n = 3) | Upstream CLT1-US (n = 3) | Downstream CLT1-DS (n = 3) |
|                 |       |                      | Average ± SD                            | Average ± SD                        | Average ± SD             | Average ± SD               |
| TOC             | %     | 10 <sup>α</sup>      | 0.12 ± 0.035                            | 0.11 ± 0.012                        | 0.88 ± 0.20              | 1.57 ± 1.72                |
| Aluminum (Al)   | mg/kg | -                    | 584 ± 185                               | 2,757 ± 1,141                       | 7,390 ± 537              | 5,847 ± 1,242              |
| Antimony (Sb)   | mg/kg | -                    | <0.10 ± 0                               | <0.10 ± 0                           | <0.10 ± 0                | <0.10 ± 0                  |
| Arsenic (As)    | mg/kg | 17                   | 0.22 ± 0.11                             | 0.38 ± 0.10                         | 0.69 ± 0.12              | 0.67 ± 0.17                |
| Barium (Ba)     | mg/kg | -                    | 2.72 ± 0.722                            | 12.6 ± 5.05                         | 17.8 ± 3.22              | 26.2 ± 5.97                |
| Beryllium (Be)  | mg/kg | -                    | <0.10 ± 0                               | 0.14 ± 0.040                        | 0.28 ± 0.032             | 0.23 ± 0.045               |
| Bismuth (Bi)    | mg/kg | -                    | <0.20 ± 0                               | <0.20 ± 0                           | <0.20 ± 0                | <0.20 ± 0                  |
| Boron (B)       | mg/kg | -                    | <5.0 ± 0                                | 5.4 ± 0.75                          | 9.3 ± 0.85               | 5.5 ± 0.81                 |
| Cadmium (Cd)    | mg/kg | 3.5                  | <0.020 ± 0                              | <0.020 ± 0                          | 0.047 ± 0.0078           | 0.049 ± 0.0042             |
| Calcium (Ca)    | mg/kg | -                    | 494 ± 249                               | 2,750 ± 894                         | 2,660 ± 230              | 3,703 ± 948                |
| Chromium (Cr)   | mg/kg | 90                   | 7.79 ± 5.39                             | 13.6 ± 4.34                         | 26.7 ± 2.40              | 21.2 ± 6.39                |
| Cobalt (Co)     | mg/kg | -                    | 0.953 ± 0.558                           | 2.40 ± 0.758                        | 6.40 ± 0.864             | 5.27 ± 1.42                |
| Copper (Cu)     | mg/kg | 110 <sup>α</sup>     | 1.21 ± 0.899                            | 4.45 ± 2.50                         | 23.9 ± 11.1              | 11.6 ± 4.95                |
| Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 12,493 ± 9,700                          | 11,063 ± 2,423                      | 22,833 ± 5,773           | 26,533 ± 9,287             |
| Lead (Pb)       | mg/kg | 91                   | 1.49 ± 0.546                            | 3.07 ± 0.857                        | 4.13 ± 0.654             | 5.73 ± 2.39                |
| Lithium (Li)    | mg/kg | -                    | <2.0 ± 0                                | 5.0 ± 2.3                           | 11.2 ± 0.462             | 7.8 ± 1.4                  |
| Magnesium (Mg)  | mg/kg | -                    | 444 ± 165                               | 2,810 ± 1,212                       | 8,297 ± 274              | 6,910 ± 1,790              |
| Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 27.4 ± 14.6                             | 76 ± 29.4                           | 167 ± 34                 | 247 ± 73                   |
| Mercury (Hg)    | mg/kg | 0.486                | <0.0050 ± 0                             | <0.0050 ± 0                         | 0.0051 ± 0.00017         | 0.0059 ± 0.0015            |
| Molybdenum (Mo) | mg/kg | -                    | <0.10 ± 0                               | 0.11 ± 0.023                        | 0.29 ± 0.080             | 1.07 ± 0.436               |
| Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 1.76 ± 0.920                            | 6.11 ± 1.99                         | 18.9 ± 1.55              | 23.4 ± 9.28                |
| Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 167 ± 98                                | 350 ± 118                           | 261 ± 27.8               | 235 ± 84.7                 |
| Potassium (K)   | mg/kg | -                    | 133 ± 42                                | 750 ± 320                           | 1,260 ± 120              | 2,127 ± 738                |
| Selenium (Se)   | mg/kg | -                    | <0.20 ± 0                               | <0.20 ± 0                           | <0.20 ± 0                | <0.20 ± 0                  |
| Silver (Ag)     | mg/kg | -                    | <0.10 ± 0                               | <0.10 ± 0                           | <0.10 ± 0                | <0.10 ± 0                  |
| Sodium (Na)     | mg/kg | -                    | <50 ± 0                                 | 68 ± 21                             | 78 ± 6.51                | 75 ± 22                    |
| Strontium (Sr)  | mg/kg | -                    | 2.00 ± 0.544                            | 4.72 ± 1.01                         | 2.85 ± 0.195             | 4.0 ± 1.13                 |
| Sulphur (S)     | mg/kg | -                    | <1,000 ± 0                              | <1,000 ± 0                          | <1,000 ± 0               | <1,000 ± 0                 |
| Thallium (Tl)   | mg/kg | -                    | <0.050 ± 0                              | 0.068 ± 0.023                       | 0.097 ± 0.021            | 0.122 ± 0.0321             |
| Tin (Sn)        | mg/kg | -                    | <2.0 ± 0                                | <2.0 ± 0                            | <2.0 ± 0                 | <2.0 ± 0                   |
| Titanium (Ti)   | mg/kg | -                    | 83 ± 47                                 | 353 ± 123                           | 442 ± 58                 | 400 ± 60                   |
| Uranium (U)     | mg/kg | -                    | 0.479 ± 0.247                           | 0.922 ± 0.298                       | 0.898 ± 0.0956           | 1.52 ± 0.510               |
| Vanadium (V)    | mg/kg | -                    | 16.8 ± 12.8                             | 19.5 ± 5.06                         | 24.3 ± 2.54              | 15.8 ± 4.95                |
| Zinc (Zn)       | mg/kg | 315                  | 3.0 ± 1.2                               | 10.3 ± 4.31                         | 18.9 ± 2.22              | 26.3 ± 6.40                |
| Zirconium (Zr)  | mg/kg | -                    | 2.1 ± 0.91                              | 5.8 ± 2.0                           | 2.7 ± 0.10               | 4.7 ± 1.3                  |

 Indicates parameter concentration above SQG.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

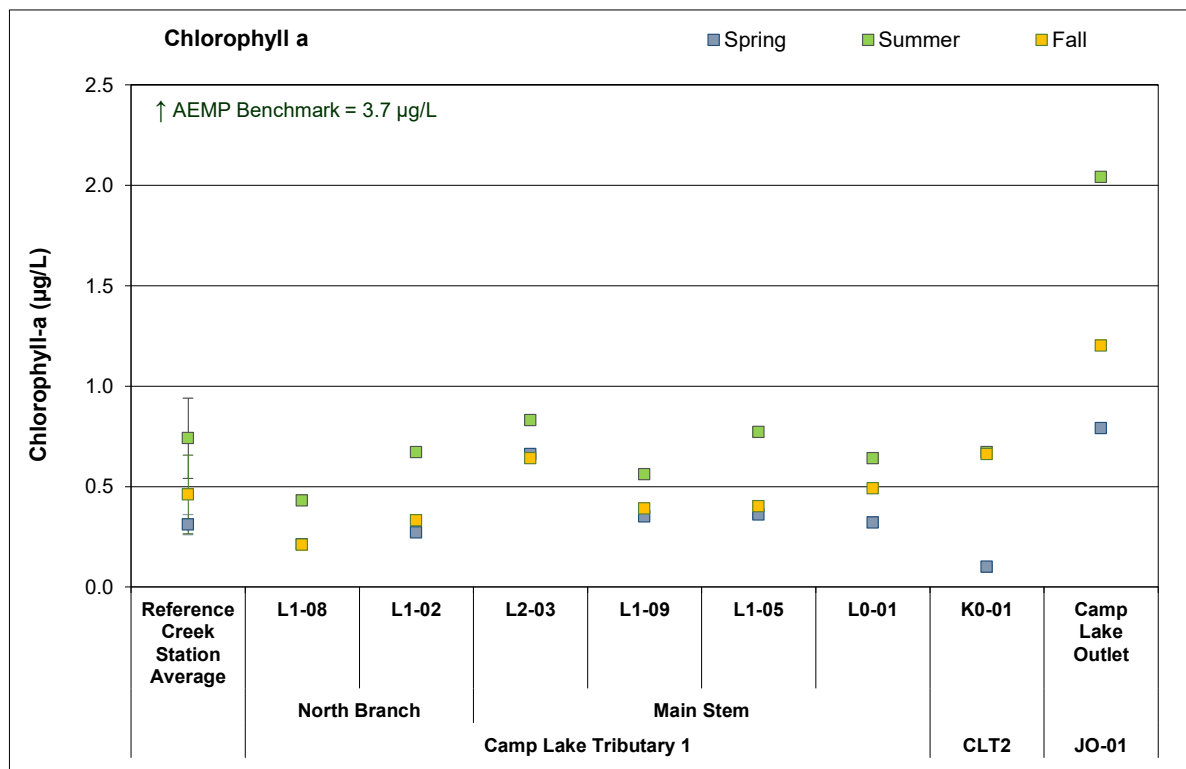


**Figure 3.2:** Chlorophyll-a Concentrations at Camp Lake Tributary 1 (CLT1) and Tributary 2 (CLT2) Phytoplankton Monitoring Stations, Mary River Project CREMP, 2020

C.14 and C.15). Nevertheless, chlorophyll-a concentrations at all CLT1 north branch and main stem monitoring stations were well below the AEMP benchmark of 3.7 µg/L for all seasonal sampling events in 2020 (Figure 3.2). Similar to the reference creek stations, chlorophyll-a concentrations at all CLT1 stations in 2020 suggested low (i.e., oligotrophic) phytoplankton productivity based on Dodds et al. (1998) trophic status classification for stream environments (i.e., chlorophyll-a < 10 µg/L). This trophic status classification was also consistent with an 'ultra-oligotrophic' to 'oligotrophic' WQG categorization (CCME 2020) for CLT1 based on aqueous total phosphorus concentrations typically less than 10 µg/L at each CLT1 north branch and main stem station during all spring, summer, and fall sampling events (Appendix Table C.14).

Chlorophyll-a concentrations at the CLT1 north branch in fall 2020 were similar to, or lower than, those observed in the fall during the baseline period (i.e., 2005 to 2013; Figure 3.3). At the CLT1 main stem, chlorophyll-a concentrations were higher in mine operational years from 2015 to 2020 than during the mine baseline period except for at the CLT1 mouth (Station L0-01; Figure 3.3). However, no pattern of increasing chlorophyll-a concentrations was indicated among the years of mine operation at any of the CLT1 north branch or lower main stem stations, and concentrations were continuously lower than the AEMP benchmark of 3.7 µg/L from 2015 to 2020 (Figure 3.3). Overall, the spatial and temporal analyses of chlorophyll-a concentrations suggested that the mine operation may have contributed to slightly higher phytoplankton abundance at CLT1 main stem stations during spring and fall sampling events, but not at the north branch or at the mouth of the main stem compared to reference conditions. As indicated above, higher phytoplankton abundance within the CLT1 main stem was consistent with the occurrence of higher aqueous nutrient concentrations (e.g., nitrate) compared to water quality at the reference creeks. This suggested that slightly greater phytoplankton abundance at the CLT1 main stem was the result of current mine operations and specifically, the introduction of nutrients to the system because of active quarrying at the QMR2 pit. Despite slightly greater phytoplankton abundance at the CLT1 main stem stations than at the reference creeks in spring and fall of 2020, the CLT1 north branch and main stem have remained 'oligotrophic' since the commencement of commercial mine operation in 2015.

### **3.1.4 Benthic Invertebrate Community**

#### **3.1.4.1 Upstream North Branch (CLT1 US)**

Benthic invertebrate density at the CLT1 upstream (north branch) was significantly greater than at the reference creek, and no significant differences in richness and Simpson's Evenness were indicated between the CLT1 north branch and Unnamed Reference Creek study areas (Table 3.3; Appendix Figure F.1). Differences in benthic invertebrate community assemblage between the



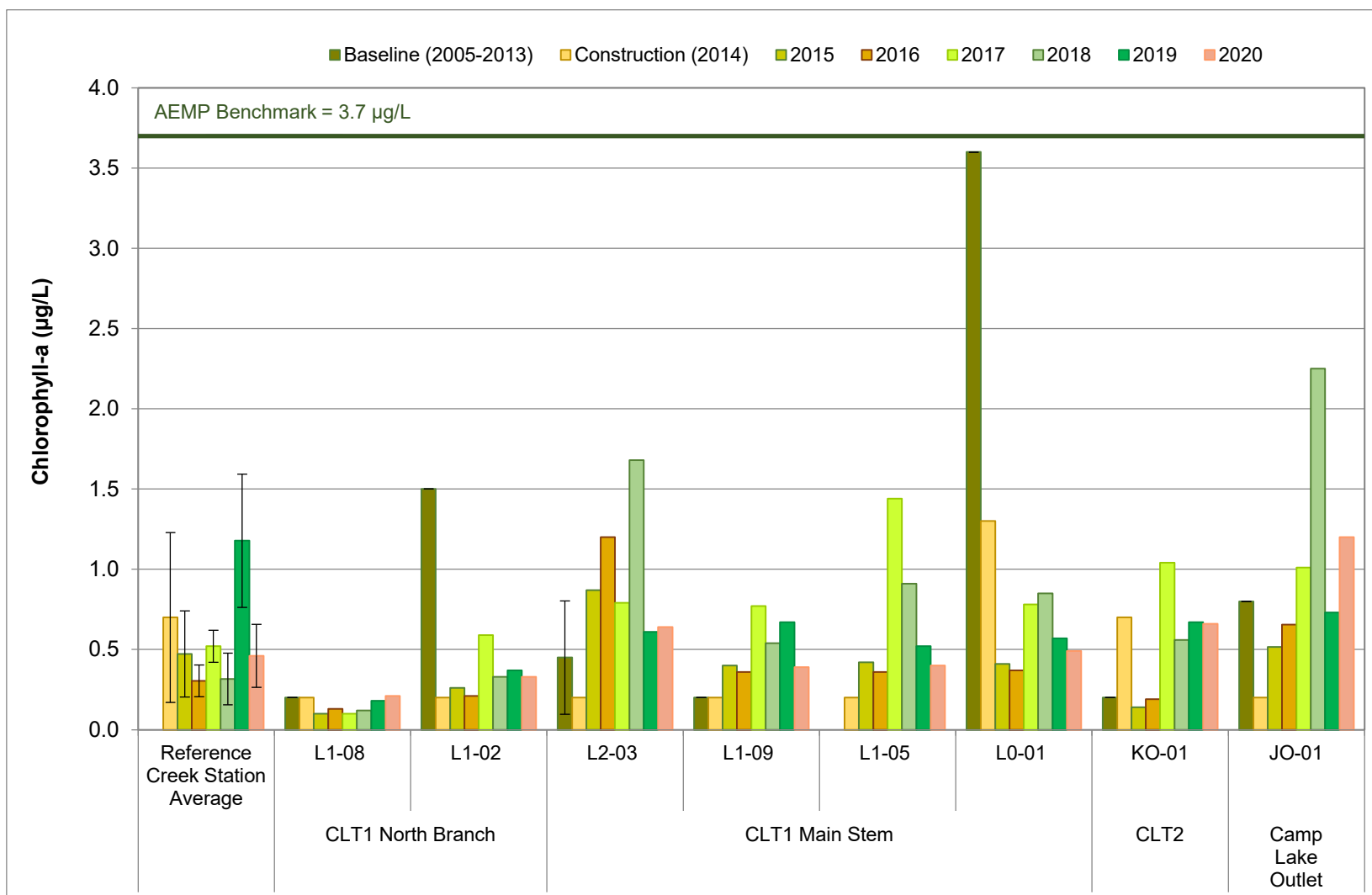


**Figure 3.3: Temporal Comparison of Chlorophyll-a Concentrations at Camp Lake Tributary 1 (CLT-1) and Tributary 2 (CLT-2) for Mine Baseline (2005 to 2013), Construction (2014), and Operational (2015 to 2020) Periods during Fall**

Note: Reference creek data represented by average ( $\pm$  SD;  $n = 4$ ) calculated from CLT-REF and MRY-REF stations.



**Table 3.3: Benthic Invertebrate Community Metric Statistical Comparison Results among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                                       | Overall 3-Area Comparison     |                     |                                     |         | Pair-wise, <i>post hoc</i> comparisons |       |                         |                                  |                     |
|----------------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------|-------|-------------------------|----------------------------------|---------------------|
|                                              | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Areas? | P-value | Study Area                             | Mean  | Standard Deviation (SD) | Magnitude of Difference (Ref SD) | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )            | ANOVA                         | none                | YES                                 | 0.009   | Reference Creek                        | 713   | 296                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 1,635 | 711                     | 3.1                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 626   | 261                     | -0.3                             | a                   |
| Richness (No. of Taxa)                       | ANOVA                         | none                | NO                                  | 0.358   | Reference Creek                        | 16.0  | 4.4                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 19.2  | 2.5                     | 0.7                              | a                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 17.4  | 3.1                     | 0.3                              | a                   |
| Simpson's Evenness                           | ANOVA                         | none                | NO                                  | 0.216   | Reference Creek                        | 0.840 | 0.043                   | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 0.884 | 0.032                   | 1.0                              | a                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 0.828 | 0.067                   | -0.3                             | a                   |
| Nemata (% of community)                      | ANOVA                         | log10(x+1)          | NO                                  | 0.235   | Reference Creek                        | 0.7   | 1.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 1.3   | 1.1                     | 0.4                              | a                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 2.1   | 1.0                     | 1.0                              | a                   |
| Oligochaeta (% of community)                 | ANOVA                         | log10               | YES                                 | 0.004   | Reference Creek                        | 1.9   | 1.5                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 4.4   | 1.3                     | 1.6                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 11.5  | 8.4                     | 6.5                              | b                   |
| Hydracarina (% of community)                 | ANOVA                         | log10(x+1)          | NO                                  | 0.286   | Reference Creek                        | 4.5   | 3.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 3.0   | 2.5                     | -0.4                             | a                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 1.6   | 1.6                     | -0.8                             | a                   |
| Ostracoda (% of community)                   | K-W                           | rank                | YES                                 | 0.005   | Reference Creek                        | 30.6  | 11.7                    | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 0.5   | 0.6                     | -2.6                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 0.1   | 0.2                     | -2.6                             | b                   |
| Chironomidae (% of community)                | ANOVA                         | log10               | YES                                 | <0.001  | Reference Creek                        | 48.3  | 12.9                    | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 81.7  | 7.9                     | 2.6                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 75.8  | 7.1                     | 2.1                              | b                   |
| Metal Sensitive Chironomids (% of community) | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | Reference Creek                        | 0.8   | 1.2                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 13.8  | 4.7                     | 10.5                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 3.6   | 1.6                     | 2.2                              | a                   |
| Simuliidae (% of community)                  | K-W                           | rank                | YES                                 | 0.074   | Reference Creek                        | 9.8   | 8.6                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 0.3   | 0.3                     | -1.1                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 0.2   | 0.2                     | -1.1                             | b                   |
| Tipulidae (% of community)                   | K-W                           | rank                | YES                                 | 0.048   | Reference Creek                        | 1.5   | 2.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 7.4   | 6.2                     | 2.6                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 6.2   | 2.0                     | 2.0                              | b                   |
| Collector-Gatherer FFG (% of community)      | ANOVA                         | none                | YES                                 | <0.001  | Reference Creek                        | 80.7  | 8.8                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 58.5  | 8.9                     | -2.5                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 81.6  | 4.5                     | 0.1                              | a                   |
| Filterer FFG (% of community)                | ANOVA                         | log10(x+1)          | YES                                 | 0.099   | Reference Creek                        | 9.9   | 8.9                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 4.4   | 5.3                     | -0.6                             | ab                  |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 0.9   | 1.2                     | -1.0                             | b                   |
| Shredder FFG (% of community)                | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | Reference Creek                        | 2.8   | 2.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 32.8  | 6.8                     | 11.3                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 14.1  | 4.2                     | 4.3                              | c                   |
| Clinger HPG (% of community)                 | ANOVA                         | log10               | YES                                 | 0.001   | Reference Creek                        | 15.8  | 7.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 33.2  | 11.6                    | 2.3                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 10.3  | 2.9                     | -0.7                             | a                   |
| Sprawler HPG (% of community)                | ANOVA                         | none                | YES                                 | <0.001  | Reference Creek                        | 79.4  | 6.6                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 52.6  | 9.7                     | -4.1                             | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 69.1  | 4.8                     | -1.6                             | a                   |
| Burrower FFG (% of community)                | ANOVA                         | log10               | YES                                 | 0.001   | Reference Creek                        | 4.8   | 3.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT1 Upstream                          | 13.5  | 4.8                     | 2.6                              | b                   |
|                                              |                               |                     |                                     |         | CLT1 Downstream                        | 20.6  | 7.4                     | 4.8                              | b                   |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

 Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference between the mine-exposed area and reference area was ecologically meaningful.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

CLT1 north branch and Unnamed Reference Creek, as indicated by significantly differing Bray-Curtis Index (Appendix Table F.7), included ecologically significant<sup>6</sup> greater relative abundance of Chironomidae and Tipulidae dominant groups, and lower relative abundance of Ostracoda, at the CLT1 north branch (Table 3.3). Within the Chironomidae, an ecologically significantly higher relative abundance of metal-sensitive taxa was indicated at the CLT1 north branch than at the reference creek, indicating no adverse influences on biota related to metals within the watercourse. Key differences in FFGs and HPGs, including significantly higher relative abundance of the shredder FFG, clinger HPG, and burrower HPG at the CLT1 north branch, were consistent with greater amounts of in-stream vegetation (e.g., bryophyte mosses) than at the reference creek as reported in previous CREMP studies (e.g., Minnow 2020). No consistent ecologically significant differences in density, richness, Simpson's Evenness, dominant taxonomic groups, or FFGs were indicated at the CLT1 north branch in 2020 compared to baseline studies conducted in 2007 and 2011 (Appendix Tables F.8 and F.9; Appendix Figure F.2). Collectively, the 2020 data suggested that differences in benthic invertebrate community assemblage between the CLT1 north branch and Unnamed Reference Creek reflected differences in the types and/or abundance of in-stream vegetation between these study areas. This was supported by comparisons to baseline, which indicated no ecologically significant changes in benthic invertebrate community metrics at the CLT1 north branch since the commencement of commercial mine operations in 2015.

#### 3.1.4.2 Downstream Lower Main Stem (CLT1 DS)

The benthic invertebrate community at the lower main stem of Camp Lake Tributary 1 (CLT1 DS), downstream of the Milne Inlet Tote Road crossing, did not differ significantly in density, richness, or Simpson's Evenness compared to Unnamed Reference Creek in 2020 (Table 3.3; Appendix Figure F.1). Differences in benthic invertebrate community assemblage between CLT1 DS and the reference creek, as indicated by significantly differing Bray-Curtis Index (Appendix Table F.7), included ecologically significant greater relative abundance of Oligochaeta, Chironomidae, and Tipulidae dominant groups, and lower relative abundance of Ostracoda, at CLT1 DS (Table 3.3). However, similar to the CLT1 north branch, no significant difference in the relative abundance of metal-sensitive Chironomidae and ecologically significant higher relative abundance of the shredder FFG and the burrower HPG occurred at CLT1 DS compared to the reference creek

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<sup>6</sup> Ecological significance is defined as a magnitude of difference between the mine-exposed and reference area that is outside of a CES (CES<sub>BIC</sub>) of  $\pm 2$  reference area SDs (SD<sub>REF</sub>) for the benthic invertebrate community metric. Differences outside of the CES<sub>BIC</sub> are greater than those that would be expected to occur naturally (i.e., between two pristine reference areas), and thus require additional evaluation to determine whether the difference is mine-related considering the direction of response and taking a weight-of-evidence approach that considers the results from other study components (e.g., water chemistry) and benthic invertebrate community endpoints.



in 2020 (Table 3.3). This indicated that the differences in community features between CLT1 DS and Unnamed Reference Creek were unlikely associated with metal concentrations, but rather due to naturally differing habitat (e.g., food resources and/or substrate properties) between study areas. No consistent ecologically significant differences in density, richness, Simpson's Evenness, or dominant taxonomic groups, including the proportion of metal-sensitive chironomids, were indicated at the CLT1 lower main stem in 2020 compared to both of the 2007 and 2011 baseline studies (Appendix Table F.10; Appendix Figure F.2). A significantly higher relative abundance of the collector-gatherer FFG was generally shown at CLT1 DS since 2015 compared to baseline, potentially indicating a shift in food resources available to benthic invertebrates at the lower main stem area over time (Appendix Table F.11). However, the absence of consistent ecologically significant differences in the relative abundance of metal-sensitive taxa in years of mine operation compared to baseline suggested that the FFG differences over time were unrelated to differing metal concentrations.

Between the CLT1 study areas, benthic invertebrate density, shredder FFG relative abundance, and clinger HPG relative abundance were significantly lower downstream than upstream of the Milne Inlet Tote Road crossing, but no significant differences in richness, evenness, or dominant taxonomic groups were indicated between the downstream and upstream areas in 2020 (Table 3.3; Appendix Figure F.1). Similar to differences in community features between the CLT1 north branch and reference creek, these differences in community features between CLT1 study areas reflected lower abundance of in-stream vegetation (e.g., mosses), which serves as a key food resource and habitat for the shredder FFG and clinger HPG, respectively, at the downstream area compared to upstream of the Milne Inlet Tote Road crossing. Therefore, in-stream vegetation was the key contributor to differences in benthic invertebrate density and FFG and HPG composition between the CLT1 lower main stem and upstream study areas in 2020 rather than influences associated with the Milne Inlet Tote Road.

### **3.1.5 Effects Assessment and Recommendations**

#### **3.1.5.1 Upstream North Branch (CLT1 US)**

At the CLT1 north branch, the following AEMP benchmarks were exceeded in 2020:

- Aqueous total copper concentration greater than the benchmark of 0.0022 mg/L in spring and summer (0.00221 mg/L and 0.00226 mg/L, respectively) at Station L1-08.

Copper concentrations at the CLT1 north branch in spring of 2019 and 2020, and in fall from 2015 to 2020, were slightly higher than concentrations in respective seasonal sampling events during baseline. However, copper concentrations at the CLT1 north branch during summer sampling events from 2015 to 2020 were comparable to baseline, but were also shown to be



above the AEMP benchmark in 29% of samples taken (Appendix Figure C.2). In addition, copper concentrations in spring and fall during years of mine commercial production from 2015 to 2020 were comparable to those shown in summer during baseline. No substantial mine development has occurred in the CLT1 north branch watershed, and thus mine-related sources of copper to this portion of the watercourse potentially included fugitive dust. However, because copper concentrations farther downstream at the CLT1 main stem, closer to sources of dust generation, were below AEMP benchmarks, the source of copper to the CLT1 north branch was likely related natural minerology of the bedrock/overburden in the region of the mine. Metal concentrations in sediment of the CLT1 north branch were well below SQG. In addition, no adverse effects on phytoplankton (chlorophyll-a) or benthic invertebrates of the CLT1 north branch were indicated in 2020, nor during studies conducted since the commencement of commercial mine production in 2015, indicating that copper concentrations above the AEMP benchmark at the CLT1 north branch may not have been biologically available.

Following application of the Mary River Project AEMP Management Response Framework (Figure 2.8), uncertainty in whether a change in copper concentrations has occurred at the CLT1 north branch between the period of commercial mine production and baseline results in a low action response related to copper concentrations above the AEMP benchmark at this watercourse. An expanded spatial water quality sampling program implemented at the CLT1 north branch as a special investigation to identify whether the source(s) of copper to the watercourse reflect natural minerology of the bedrock/overburden within the watershed is recommended as an initial low action response.

### **3.1.5.2 Downstream Main Stem (CLT1 DS)**

At the CLT1 main stem, the following AEMP benchmarks were exceeded in 2020:

- Aqueous total aluminum concentration was greater than the benchmark of 0.179 mg/L in spring at the upper main stem Station L2-03 (0.270 mg/L); and,
- Aqueous total iron concentration was greater than the benchmark of 0.326 mg/L at upper main stem Station L2-03 in spring, summer, and fall (0.420 mg/L, 0.423 mg/L, and 0.522 mg/L, respectively).

Concentrations of all parameters were below AEMP water quality benchmarks at all stations within the lower main stem (i.e., Stations L1-09, L0-05, and L0-01), and metal concentrations in sediment were below SQG at the CLT1 downstream area (CLT1 DS), in 2020. Elevation of total aluminum concentrations above the AEMP water quality benchmark at the upper main stem in spring 2020 was related to suspended mineral material in the water column as reflected by high turbidity in these samples. Because total aluminum concentrations at the CLT1 main stem in



2020 were not elevated compared to the reference creek nor to concentrations at the upper main stem during baseline, the source of aluminum to the CLT1 main stem was likely related to background mineralogy of material entering the system during spring runoff events. In contrast, iron concentrations at the CLT1 upper main stem in 2020 were elevated compared to concentrations at the reference creek and at CLT1 during baseline, suggesting a mine-related source of iron to the system. Relatively high iron concentrations at the CLT1 main stem following the initiation of commercial mine operation potentially reflected blasting/excavating activity (including associated dust generation) at the Mine Site QMR2 Quarry, as well as fugitive dust generation from increased truck usage on the Milne Inlet Tote Road, compared to the baseline period. Despite elevated iron concentrations at the CLT1 upper main stem, no adverse effects on phytoplankton and benthic invertebrates were indicated at the CLT1 downstream in 2020, suggesting that potential biological effects from elevated iron concentrations were likely limited only to the CLT1 upper main stem and did not extend to the lower main stem or Camp Lake.

Under the Mary River Project AEMP Data Management Response Framework (Figure 2.8), the determination of a mine-related change to a parameter concentration above the AEMP benchmark necessitates a management response (Steps 2 and 3). Because a mine-related elevation in iron concentrations occurred at the CLT1 upper main stem in 2020, but the spatial extent was limited and no biological effects were observed a short distance downstream, consideration for the establishment of benthic invertebrate community sampling stations at the CLT1 upper main stem, close to water quality Station L2-03, is recommended to evaluate possible effects on biota in this portion of the CLT1 system as a low action response.

## **3.2 Camp Lake Tributary 2 (CLT2)**

### **3.2.1 Water Quality**

Camp Lake Tributary 2 (CLT2) dissolved oxygen was consistently near full saturation at the time of spring, summer, and fall monitoring events, and concentrations were comparable to or slightly higher than those at the reference creeks (Appendix Tables C.1 to C.3; Figure 3.4). In addition, dissolved oxygen concentrations at CLT2 were well above the WQG lowest acceptable concentration for early life stages of cold-water biota (i.e., 9.5 mg/L) at the time of biological sampling in August 2020 (Figure 3.4; Appendix Table C.12). Aqueous pH at the CLT2 upstream and downstream study areas was generally slightly higher (i.e., more alkaline) than at the reference creeks but consistently well within WQG limits during the spring, summer, and fall sampling events in 2020 (Appendix Tables C.1 to C.3; Figure 3.4). No significant difference in pH was indicated between CLT2 study areas located downstream and upstream of the Milne Inlet Tote Road suggesting that this road crossing did not markedly influence the pH of CLT2 (Appendix Table C.19). *In situ* specific conductance was consistently higher at CLT2 compared



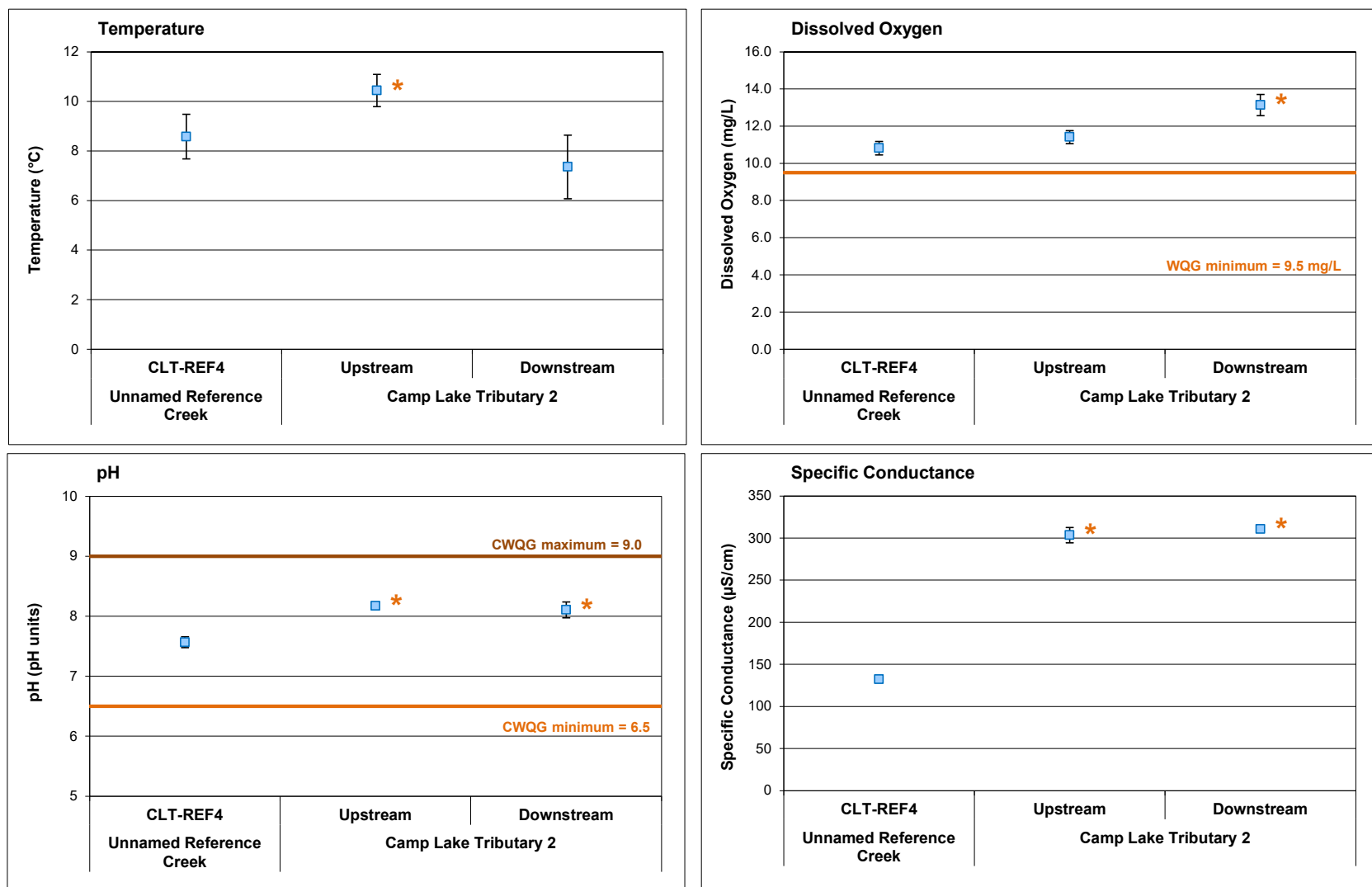


**Figure 3.4: Comparison of *In Situ* Water Quality Variables (mean  $\pm$  SD; n = 5) Measured at Camp Lake Tributary 2 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: An asterisk (\*) next to data point indicates mean value differs significantly from the Unnamed Reference Creek mean.



to the reference creeks in 2020, and was also significantly higher downstream compared to upstream of the Milne Inlet Tote Road at CLT2 during August 2020 biological sampling (Figure 3.4; Appendix Table C.19), suggesting a slight influence of the road on water quality at CLT2.

Water chemistry at CLT2 (Station KO-01) met all AEMP benchmarks and WQG in spring, summer, and fall sampling events of 2020 (Table 3.4). Among those parameters with established AEMP benchmarks, nitrate and sulphate concentrations showed moderate elevation (i.e., 5--to 10-fold) at CLT2 compared to mean concentrations at the reference creeks, but only during the spring sampling event in 2020 (Appendix Table C.15).<sup>7</sup> Chloride and sulphate concentrations were the only parameters with established AEMP benchmarks that were higher at CLT2 in 2020 compared to baseline, but concentrations of both of these parameters remained well below the AEMP benchmarks since the commencement of commercial mine operations in 2015 (Appendix Figure C.3). In addition, concentrations of chloride and sulphate at CLT2 were similar to those observed at the reference creeks in 2020, suggesting a natural factor may have accounted for higher concentrations of these parameters at CLT2 since baseline. For those parameters without AEMP benchmarks, only sodium and total and dissolved uranium concentrations showed elevation at CLT2 in 2020 compared to baseline. In consideration of all spatial and temporal (baseline) comparisons, no marked mine-related influence on water quality was indicated within the CLT2 system in 2020.

### 3.2.2 Sediment Quality

Sediment from CLT2 upstream (CLT2-US) and downstream (CLT2-DS) study areas was visually characterized as medium-sized coarse sand (Appendix Table D.7). The in-stream substrate at both CLT2 study areas was composed mainly of cobble material (i.e., substrate diameter 6 to 25 cm), with sand constituting a trace amount (i.e., <1%) and approximately 5% of the material observed at the sediment surface of the upstream and downstream areas, respectively (Minnow 2018). Mean sediment TOC content was low (i.e., <0.5%) at both CLT2 study areas, but approximately 2 to 3 times greater than the mean TOC content in sediment sampled at the lotic reference areas (Table 3.5; Appendix Table D.10).

Similar to CLT1, mean concentrations of metals in sediment from CLT2 were generally elevated compared to those measured at the lotic reference areas (Appendix Table D.10). This was particularly the case for calcium, copper, magnesium, nickel, and potassium, for which mean concentrations were five-fold or greater at one or both of CLT2-US and CLT2-DS study areas compared to mean concentrations at the lotic reference areas (Table 3.5; Appendix Table D.10).

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<sup>7</sup> This statement includes the evaluation of both total and dissolved metal concentrations.



Table 3.4: Mean Water Chemistry at Camp Lake Tributary 2 (CLT2) Monitoring Stations During Spring, Summer, and Fall, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Reference Creeks (n=4) |           |          | Camp Lake Tributary 2 |            |            |
|---------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|------------------------|-----------|----------|-----------------------|------------|------------|
|                           |                                    |         |                                            |                             | Spring                 | Summer    | Fall     | Spring                | Summer     | Fall       |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                           | 55                     | 134       | 175      | 154                   | 300        | 345        |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.63                   | 8.01      | 8.05     | 8.18                  | 8.34       | 8.43       |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 23.6                   | 57.05     | 82.6     | 70                    | 147        | 167        |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 3.2                    | 2.7       | 2        | <2.0                  | <2.0       | <2.0       |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 85                     | 85        | 99       | 120                   | 153        | 192        |
|                           | Turbidity                          | NTU     | -                                          | -                           | 1.87                   | 6.62      | 2.49     | 0.55                  | 0.20       | 0.23       |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 24                     | 61        | 69       | 62                    | 134        | 136        |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.01                   | 0.01225   | 0.01     | <0.010                | <0.010     | <0.010     |
|                           | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                  | 0.062     | 0.076    | 0.135                 | 0.047      | 0.148      |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                  | 0.005     | 0.005    | <0.0050               | <0.0050    | <0.0050    |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.02                   | 0.15      | 0.15     | 0.14                  | <0.15      | <0.15      |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.93                   | 3.44      | 2.31     | 2.81                  | 3.88       | 3.08       |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.23                   | 3.05      | 2.14     | 3.86                  | 4.36       | 3.50       |
|                           | Total Phosphorus                   | mg/L    | 0.030 <sup>d</sup>                         | -                           | 0.0045                 | 0.0065    | 0.0039   | 0.0075                | <0.0030    | <0.0030    |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | 0.0010                 | 0.0010    | 0.0021   | <0.0010               | <0.0010    | 0.0017     |
|                           | Bromide (Br)                       | -       | -                                          | -                           | 0.10                   | 0.1       | 0.1      | <0.10                 | <0.10      | <0.10      |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.2                    | 4.07      | 7.09     | 2.4                   | 9.1        | 13.6       |
| Total Metals              | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 1.31                   | 5.52      | 9.25     | 11.80                 | 14.90      | 26.20      |
|                           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                       | 0.0775                 | 0.3106    | 0.0593   | 0.0229                | 0.0094     | 0.0089     |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0001                 | 0.0001    | 0.0001   | <0.00010              | <0.00010   | <0.00010   |
| Total Metals              | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.00010                | 0.00013   | 0.00010  | <0.00010              | <0.00010   | <0.00010   |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00362                | 0.00948   | 0.01031  | 0.00856               | 0.01550    | 0.01840    |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | 0.0005                 | 0.0004    | 0.0005   | <0.00050              | <0.00050   | <0.00050   |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                 | 0.0003875 | 0.0005   | <0.00050              | <0.00050   | <0.00050   |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                   | 0.01      | 0.01     | <0.010                | <0.010     | <0.010     |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                     | 0.00001                | 0.00001   | 0.00001  | <0.000010             | <0.000010  | <0.000010  |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                           | 4.9                    | 11.8      | 16.5     | 13.9                  | 27.6       | 31.8       |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00050                | 0.00082   | 0.00050  | <0.00050              | <0.00050   | <0.00050   |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.0040                      | 0.00010                | 0.00016   | 0.00010  | <0.00010              | <0.00010   | <0.00010   |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                      | 0.00071                | 0.00115   | 0.00102  | 0.00116               | 0.00159    | 0.00152    |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.077                  | 0.2425    | 0.06625  | <0.030                | <0.030     | <0.030     |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000107               | 0.000226  | 0.000092 | <0.000050             | <0.000050  | <0.000050  |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                 | 0.0011    | 0.0010   | 0.0012                | 0.0021     | 0.0019     |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 2.86                   | 6.7       | 9.6      | 8.9                   | 16.6       | 20.3       |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00136                | 0.00300   | 0.00102  | 0.00093               | 0.00230    | 0.00077    |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.0000050              | 0.000005  | 0.000005 | <0.0000050            | <0.0000050 | <0.0000050 |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00015                | 0.00045   | 0.00057  | 0.00031               | 0.00059    | 0.00073    |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                | 0.00070   | 0.00057  | 0.00052               | 0.00074    | 0.00065    |
|                           | Potassium (K)                      | mg/L    | -                                          | -                           | 0.45                   | 0.93      | 1.04     | 1.20                  | 2.10       | 2.45       |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.0010                 | 0.0007625 | 0.001    | <0.0010               | <0.0010    | <0.0010    |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.62                   | 1.25      | 0.87     | 0.67                  | 0.86       | 0.72       |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.000010               | 0.00002   | 0.00001  | <0.000010             | <0.000010  | <0.000010  |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.83                   | 2.76      | 3.97     | 1.85                  | 5.68       | 7.36       |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00488                | 0.01391   | 0.01850  | 0.00886               | 0.01950    | 0.02210    |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.00010                | 0.00008   | 0.00010  | <0.00010              | <0.00010   | <0.00010   |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.00010                | 0.0001    | 0.0001   | <0.00010              | <0.00010   | <0.00010   |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.011                  | 0.0241    | 0.0100   | <0.010                | <0.010     | <0.010     |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00045                | 0.00405   | 0.00737  | 0.00063               | 0.00326    | 0.00460    |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | 0.0010                 | 0.0012    | 0.0010   | <0.0010               | <0.0010    | <0.0010    |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                 | 0.003     | 0.003    | <0.0030               | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**

Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsic (2013) using baseline water quality data specific to the Camp Lake tributary system.

**Table 3.5: Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 2 (CLT2) and Lotic Reference Area Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter       | Units | SQG <sup>a</sup>     | Lotic Reference Stations                |                                     | Camp Lake Tributary 2    |                            |
|-----------------|-------|----------------------|-----------------------------------------|-------------------------------------|--------------------------|----------------------------|
|                 |       |                      | Unnamed Reference Creek (REFCRK; n = 3) | Mary River Reference (GO-09; n = 3) | Upstream CLT2-US (n = 3) | Downstream CLT2-DS (n = 3) |
|                 |       |                      | Average ± SD                            | Average ± SD                        | Average ± SD             | Average ± SD               |
| TOC             | %     | 10 <sup>α</sup>      | 0.12 ± 0.035                            | 0.11 ± 0.012                        | 0.33 ± 0.11              | 0.26 ± 0.19                |
| Aluminum (Al)   | µg/g  | -                    | 584 ± 185                               | 2,757 ± 1,141                       | 4,483 ± 2,188            | 3,057 ± 1,592              |
| Antimony (Sb)   | µg/g  | -                    | <0.10 ± 0                               | <0.10 ± 0                           | <0.10 ± 0                | <0.10 ± 0                  |
| Arsenic (As)    | µg/g  | 17                   | 0.22 ± 0.11                             | 0.38 ± 0.10                         | 0.74 ± 0.28              | 0.47 ± 0.16                |
| Barium (Ba)     | µg/g  | -                    | 2.72 ± 0.722                            | 12.6 ± 5.05                         | 15.9 ± 6.70              | 9.64 ± 4.36                |
| Beryllium (Be)  | µg/g  | -                    | <0.10 ± 0                               | 0.14 ± 0.040                        | 0.19 ± 0.072             | 0.16 ± 0.056               |
| Bismuth (Bi)    | µg/g  | -                    | <0.20 ± 0                               | <0.20 ± 0                           | <0.20 ± 0                | <0.20 ± 0                  |
| Boron (B)       | µg/g  | -                    | <5.0 ± 0                                | 5.4 ± 0.75                          | 5.3 ± 0.52               | <5.0 ± 0                   |
| Cadmium (Cd)    | µg/g  | 3.5                  | <0.020 ± 0                              | <0.020 ± 0                          | 0.030 ± 0.0071           | 0.026 ± 0.0067             |
| Calcium (Ca)    | µg/g  | -                    | 494 ± 249                               | 2,750 ± 894                         | 5,277 ± 1,911            | 2,190 ± 851                |
| Chromium (Cr)   | µg/g  | 90                   | 7.79 ± 5.39                             | 13.6 ± 4.34                         | 21.6 ± 7.03              | 15.2 ± 9.49                |
| Cobalt (Co)     | µg/g  | -                    | 0.953 ± 0.558                           | 2.40 ± 0.758                        | 4.45 ± 1.67              | 2.70 ± 1.41                |
| Copper (Cu)     | µg/g  | 110 <sup>α</sup>     | 1.21 ± 0.899                            | 4.45 ± 2.50                         | 11.9 ± 4.15              | 7.46 ± 0.930               |
| Iron (Fe)       | µg/g  | 40,000 <sup>α</sup>  | 12,493 ± 9,700                          | 11,063 ± 2,423                      | 18,067 ± 8,528           | 13,590 ± 8,265             |
| Lead (Pb)       | µg/g  | 91                   | 1.49 ± 0.546                            | 3.07 ± 0.857                        | 3.49 ± 1.51              | 3.05 ± 0.879               |
| Lithium (Li)    | µg/g  | -                    | <2.0 ± 0                                | 5.0 ± 2.3                           | 6.6 ± 2.6                | 4.1 ± 1.9                  |
| Magnesium (Mg)  | µg/g  | -                    | 444 ± 165                               | 2,810 ± 1,212                       | 7,047 ± 2,826            | 4,073 ± 2,065              |
| Manganese (Mn)  | µg/g  | 1,100 <sup>α,β</sup> | 27.4 ± 14.6                             | 75.7 ± 29.4                         | 143 ± 40                 | 102 ± 50.8                 |
| Mercury (Hg)    | µg/g  | 0.486                | <0.0050 ± 0                             | <0.0050 ± 0                         | <0.0050 ± 0              | <0.0050 ± 0                |
| Molybdenum (Mo) | µg/g  | -                    | <0.10 ± 0                               | 0.11 ± 0.023                        | 0.34 ± 0.18              | 0.47 ± 0.41                |
| Nickel (Ni)     | µg/g  | 75 <sup>α,β</sup>    | 1.76 ± 0.920                            | 6.11 ± 1.99                         | 15.3 ± 7.14              | 10.2 ± 4.79                |
| Phosphorus (P)  | µg/g  | 2,000 <sup>α</sup>   | 167 ± 98                                | 350 ± 118                           | 254 ± 64                 | 177 ± 68.0                 |
| Potassium (K)   | µg/g  | -                    | 133 ± 42                                | 750 ± 320                           | 1,313 ± 881              | 1,077 ± 677                |
| Selenium (Se)   | µg/g  | -                    | <0.20 ± 0                               | <0.20 ± 0                           | <0.20 ± 0                | <0.20 ± 0                  |
| Silver (Ag)     | µg/g  | -                    | <0.10 ± 0                               | <0.10 ± 0                           | <0.10 ± 0                | <0.10 ± 0                  |
| Sodium (Na)     | µg/g  | -                    | <50 ± 0                                 | 68 ± 21                             | 63 ± 21                  | 60 ± 17                    |
| Strontium (Sr)  | µg/g  | -                    | 2.00 ± 0.544                            | 4.72 ± 1.01                         | 3.86 ± 1.018             | 2.51 ± 0.633               |
| Sulphur (S)     | µg/g  | -                    | <1,000 ± 0                              | <1,000 ± 0                          | <1,000 ± 0               | <1,000 ± 0                 |
| Thallium (Tl)   | µg/g  | -                    | <0.050 ± 0                              | 0.068 ± 0.023                       | 0.082 ± 0.043            | 0.070 ± 0.021              |
| Tin (Sn)        | µg/g  | -                    | <2.0 ± 0                                | <2.0 ± 0                            | <2.0 ± 0                 | <2.0 ± 0                   |
| Titanium (Ti)   | µg/g  | -                    | 83.3 ± 47.4                             | 353 ± 123                           | 336 ± 147                | 248 ± 111                  |
| Uranium (U)     | µg/g  | -                    | 0.5 ± 0.25                              | 0.922 ± 0.298                       | 0.743 ± 0.474            | 1.09 ± 0.332               |
| Vanadium (V)    | µg/g  | -                    | 16.8 ± 12.8                             | 19.5 ± 5.06                         | 16.5 ± 4.03              | 12.7 ± 8.70                |
| Zinc (Zn)       | µg/g  | 315                  | 3.0 ± 1.2                               | 10.3 ± 4.31                         | 13.9 ± 7.48              | 17.7 ± 8.30                |
| Zirconium (Zr)  | µg/g  | -                    | 2.1 ± 0.91                              | 5.8 ± 2.0                           | 3.7 ± 1.3                | 3.4 ± 1.6                  |

■ Indicates parameter concentration above SQG.

Notes: TOC = total organic carbon; SQG = sediment quality guideline; n = number of samples; SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life, probable effects level (PEL; CCME 2020), except those indicated by reference mark. <sup>α</sup> = Ontario Provincial Sediment Quality Objective (PSQO), severe effect level (SEL; OMOE 1993). <sup>β</sup> = British Columbia Working SQG, PEL (BC ENV 2020).

Despite higher concentrations than at the lotic reference areas, no metals were present at concentrations 1.5 times or greater at the downstream area compared to the upstream area of CLT2 (Table 3.5), suggesting minimal influence of the Milne Port Tote Road on sediment quality at CLT2-DS. Concentrations of all metals were also well below applicable SQG at all CLT2 stations (Table 3.5; Appendix Tables D.11 and D.12). Notably, metal concentrations in sediment from CLT2 were almost always lower than those from CLT1, potentially indicating reduced mine-influence with increasing distance from the mine.

### 3.2.3 Phytoplankton

Chlorophyll-a concentrations at CLT2 (Station KO-01) were within the range observed at the reference creeks during summer and fall sampling events, but were lower than concentrations at the reference creeks during the spring sampling event in 2020 (Figure 3.2). Concentrations of nutrients, including total ammonia, nitrate, and total phosphorus, were similar or higher at CLT2 compared to the reference creek stations during the spring sampling event (Appendix Tables C.14 and C.15), and therefore the occurrence of lower chlorophyll-a concentrations at CLT2 in spring 2020 did not appear to be related to differing nutrient concentrations. In addition, concentrations of all parameters were below WQG at CLT2 in spring 2020, and thus the lower chlorophyll-a concentrations at CLT2 compared to the reference creeks may have reflected natural variability (Appendix Table C.14). Notably, chlorophyll-a concentrations were well below the AEMP benchmark of 3.7 µg/L for all sampling events in 2020 at CLT2 (Figure 3.2). Low phytoplankton productivity, indicative of oligotrophic conditions, was also suggested at CLT2 based on comparison of chlorophyll-a concentrations to Dodds et al (1998) trophic status classification for creek environments. This productivity classification was supported by CCME (2020) WQG categorization of oligotrophic based on mean aqueous total phosphorus concentrations below 10 µg/L at CLT2 during all spring, summer, and fall sampling events (Table 3.4; Appendix Table C.14). Higher chlorophyll-a concentrations occurred at CLT2 from 2017 to 2020 compared to the mine baseline period for the fall sampling event, but no increasing trend over time was suggested (Figure 3.3). For the reasons indicated above, higher chlorophyll-a concentrations at CLT2 in spring 2020 compared to the baseline period did not appear to be associated with a mine-related change in nutrient concentrations over time, and thus likely reflected natural seasonal/temporal variation in chlorophyll-a concentrations.

### 3.2.4 Benthic Invertebrate Community

Benthic invertebrate density and richness at both the upstream and downstream study areas of CLT2 did not differ significantly from Unnamed Reference Creek (Table 3.6; Appendix Figure F.3). Evenness at the CLT2 downstream area differed from the reference creek, but the magnitude of this difference was within the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$  and positive (Table 3.6), indicating that this



**Table 3.6: Benthic Invertebrate Community Metric Statistical Comparison Results among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                                       | Overall 3-Area Comparison     |                     |                                     |         | Pair-wise, <i>post hoc</i> comparisons |       |                         |                                  |                     |
|----------------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------|-------|-------------------------|----------------------------------|---------------------|
|                                              | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Areas? | P-value | Study Area                             | Mean  | Standard Deviation (SD) | Magnitude of Difference (Ref SD) | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )            | ANOVA                         | log10               | NO                                  | 0.941   | Reference Creek                        | 713   | 296                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 679   | 325                     | -0.1                             | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 881   | 672                     | 0.6                              | a                   |
| Richness (No. of Taxa)                       | ANOVA                         | none                | NO                                  | 0.615   | Reference Creek                        | 16.0  | 4.4                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 17.4  | 2.2                     | 0.3                              | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 18.6  | 5.1                     | 0.6                              | a                   |
| Simpson's Evenness                           | K-W                           | rank                | YES                                 | 0.039   | Reference Creek                        | 0.840 | 0.043                   | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 0.879 | 0.058                   | 0.9                              | ab                  |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 0.921 | 0.033                   | 1.9                              | b                   |
| Nemata (% of community)                      | K-W                           | rank                | NO                                  | 0.215   | Reference Creek                        | 0.7   | 1.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 0.5   | 0.7                     | -0.2                             | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 8.2   | 15.8                    | 5.9                              | a                   |
| Oligochaeta (% of community)                 | ANOVA                         | log10(x+1)          | NO                                  | 0.181   | Reference Creek                        | 1.9   | 1.5                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 15.3  | 19.0                    | 9.0                              | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 4.4   | 5.0                     | 1.7                              | a                   |
| Hydracarina (% of community)                 | ANOVA                         | log10               | NO                                  | 0.844   | Reference Creek                        | 4.5   | 3.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 3.0   | 1.3                     | -0.4                             | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 4.7   | 4.8                     | 0.1                              | a                   |
| Ostracoda (% of community)                   | K-W                           | rank                | YES                                 | 0.007   | Reference Creek                        | 30.6  | 11.7                    | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 0.4   | 0.5                     | -2.6                             | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 0.3   | 0.5                     | -2.6                             | b                   |
| Chironomidae (% of community)                | ANOVA                         | log10               | YES                                 | 0.024   | Reference Creek                        | 48.3  | 12.9                    | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 70.4  | 14.2                    | 1.7                              | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 75.2  | 16.5                    | 2.1                              | b                   |
| Metal Sensitive Chironomids (% of community) | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | Reference Creek                        | 0.8   | 1.2                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 5.7   | 3.5                     | 3.9                              | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 11.5  | 4.2                     | 8.7                              | c                   |
| Simuliidae (% of community)                  | ANOVA                         | log10(x+1)          | YES                                 | 0.068   | Reference Creek                        | 9.8   | 8.6                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 1.9   | 1.7                     | -0.9                             | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 3.1   | 1.9                     | -0.8                             | ab                  |
| Tipulidae (% of community)                   | K-W                           | rank                | NO                                  | 0.482   | Reference Creek                        | 1.5   | 2.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 1.8   | 1.0                     | 0.1                              | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 1.8   | 2.2                     | 0.1                              | a                   |
| Collector-Gatherer FFG (% of community)      | ANOVA                         | none                | NO                                  | 0.849   | Reference Creek                        | 80.7  | 8.8                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 80.5  | 11.6                    | 0.0                              | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 77.5  | 8.7                     | -0.4                             | a                   |
| Filterer FFG (% of community)                | ANOVA                         | log10(x+1)          | YES                                 | 0.069   | Reference Creek                        | 9.9   | 8.9                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 1.7   | 1.5                     | -0.9                             | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 3.1   | 2.1                     | -0.8                             | ab                  |
| Shredder FFG (% of community)                | ANOVA                         | log10(x+1)          | YES                                 | 0.037   | Reference Creek                        | 2.8   | 2.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 8.5   | 3.1                     | 2.1                              | ab                  |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 11.2  | 7.0                     | 3.2                              | b                   |
| Clinger HPG (% of community)                 | ANOVA                         | log10               | NO                                  | 0.573   | Reference Creek                        | 15.8  | 7.7                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 12.0  | 4.2                     | -0.5                             | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 16.6  | 7.1                     | 0.1                              | a                   |
| Sprawler HPG (% of community)                | ANOVA                         | none                | NO                                  | 0.222   | Reference Creek                        | 79.4  | 6.6                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 65.1  | 17.6                    | -2.2                             | a                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 66.3  | 14.1                    | -2.0                             | a                   |
| Burrower FFG (% of community)                | ANOVA                         | log10               | YES                                 | 0.044   | Reference Creek                        | 4.8   | 3.3                     | -                                | a                   |
|                                              |                               |                     |                                     |         | CLT2 Upstream                          | 22.9  | 16.2                    | 5.5                              | b                   |
|                                              |                               |                     |                                     |         | CLT2 Downstream                        | 17.1  | 19.0                    | 3.7                              | ab                  |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

 Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference between the mine-exposed area and reference area was ecologically meaningful.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

difference was not ecologically significant nor indicative of an adverse response, respectively. Differences in community composition were indicated between CLT2 and Unnamed Reference Creek based on differing Bray-Curtis Index (Appendix Table F.7), of which the only ecologically significant differences included significantly higher and lower relative abundance of Chironomidae and Ostracoda dominant groups, respectively, at one or both CLT2 study areas compared to the reference creek (Table 3.6; Appendix Figure F.3). Ecologically significant higher relative abundance of metal-sensitive chironomids was indicated at CLT2 study areas compared to the reference creek (Table 3.6), suggesting that the community composition differences between watercourses were not likely related to metal concentrations. In addition, no ecologically significant differences in benthic invertebrate FFG and HPG were shown at both CLT2 study areas compared to the reference creek (Table 3.6), indicating no substantial differences in food resources and habitat conditions available to benthic invertebrates between CLT2 and Unnamed Reference Creek. No consistent ecologically significant differences in any benthic invertebrate community endpoints were indicated at either of the CLT2 upstream and downstream study areas over years of mine operation (2015 to 2020) compared to 2007 baseline data with the exception of routinely higher evenness at CLT2 (Appendix Tables F.15 and F.16; Appendix Figure F.4). Because high evenness is normally associated with a healthy distribution of benthic invertebrate taxa, the occurrence of significantly higher evenness at CLT2 on a routine basis from 2015 to 2020 compared to baseline was not consistent with an adverse influence related to recent mine operations. Overall, greater evenness and relative abundance of metal-sensitive taxa at CLT2 compared to the reference creek in 2020, as well as no consistent differences in density, richness, and relative abundance of dominant groups and FFG at the CLT2 study areas between mine operational and baseline periods indicated no adverse mine-related effects to benthic invertebrates at CLT2.

Between the CLT2 study areas, no significant differences in benthic invertebrate density, richness, evenness, and relative abundance of dominant taxonomic groups, FFGs, or HPGs were indicated between study areas located downstream and upstream of the Milne Inlet Tote Road crossing in 2020 (Table 3.6; Appendix Figure F.3). Therefore, no effects to benthic invertebrates were evident at CLT2 in 2020 as a result of potential influences associated with the Milne Inlet Tote Road.

### **3.2.5 Effects Assessment and Recommendations**

Water chemistry at CLT2 met all AEMP benchmarks in 2020. In addition, sediment quality met all SQG, and no adverse effects on phytoplankton or benthic invertebrates were indicated at CLT2 in 2020. Under the Mary River Project AEMP Management Response Framework, the absence of a mine-related change in AEMP benchmark parameters over time (or compared to background)





requires no further management response (Figure 2.8). Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no adjustment to the existing AEMP need be applied at CLT2 as part of the next monitoring program.

### **3.3 Camp Lake (JLO)**

#### **3.3.1 Water Quality**

*In situ* water quality profiles conducted at Camp Lake showed no substantial spatial differences in water temperature, dissolved oxygen, pH or specific conductance with progression from the CLT1 inlet to the lake outlet during any of the winter, summer, or fall seasonal sampling events in 2020 (Appendix Figures C.4 to C.7). The 2020 Camp Lake water column profiles indicated a slight increase in temperature from surface to bottom (i.e., approximately 2°C) during the winter sampling event, and a distinctly warmer surface layer extending to a depth of approximately 6 metres during the summer sampling event (Figure 3.5). The average temperature profiles at Camp Lake in summer and fall sampling events roughly mirrored those at Reference Lake 3 in 2020 (Figure 3.5). Water temperature near the bottom of the water column was significantly lower at littoral stations of Camp Lake than Reference Lake 3, but did not differ significantly between lakes at profundal stations sampled during August 2020 biological monitoring (Figure 3.6; Appendix Tables C.25).

Dissolved oxygen profiles conducted at Camp Lake in 2020 showed declining saturation levels with increased depth beginning at approximately 10 m below surface in the winter, but otherwise showed relatively minor changes from surface to bottom during the summer and fall that closely reflected the dissolved oxygen profiles observed at Reference Lake 3 (Figure 3.5). Although dissolved oxygen at the bottom of the water column was near full saturation at littoral and profundal sampling depths of Camp Lake, dissolved oxygen concentrations were significantly lower at Camp Lake than at Reference Lake 3 at the time of biological sampling in August 2020 (Figure 3.6; Appendix Table C.25). Dissolved oxygen concentrations at Camp Lake were well above the WQG minimum for the protection of sensitive stages of cold-water biota (i.e., 9.5 mg/L) during all seasonal sampling events in 2020 except at water depths greater than approximately 25 m in winter (Figure 3.6; Appendix Tables C.20 to C.22). This suggested that dissolved oxygen concentrations were not likely to be limiting to biota at Camp Lake for most of the year, except for the portion of the water column greater than 25 m deep during the winter.

*In situ* profiles showed decreasing pH with increased depth at Camp Lake and Reference Lake 3, with the changes in pH through the water column at both lakes appearing to coincide with changes in water temperature and, to a lesser extent, dissolved oxygen levels (Figure 3.5). Although pH



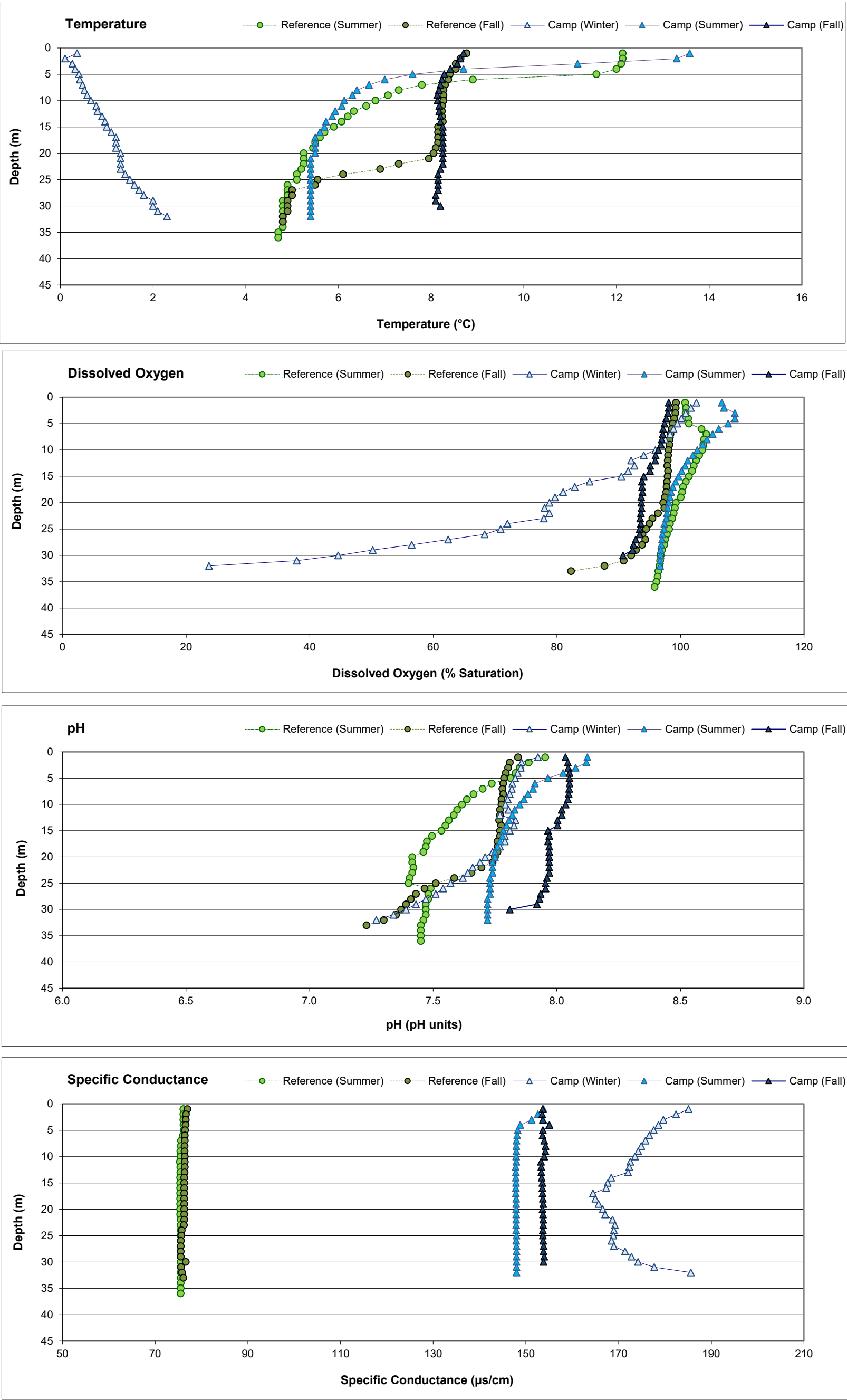


**Figure 3.5: Average *In Situ* Water Quality with Depth from Surface at Camp Lake (JLO) Compared to Reference Lake 3 during Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020**

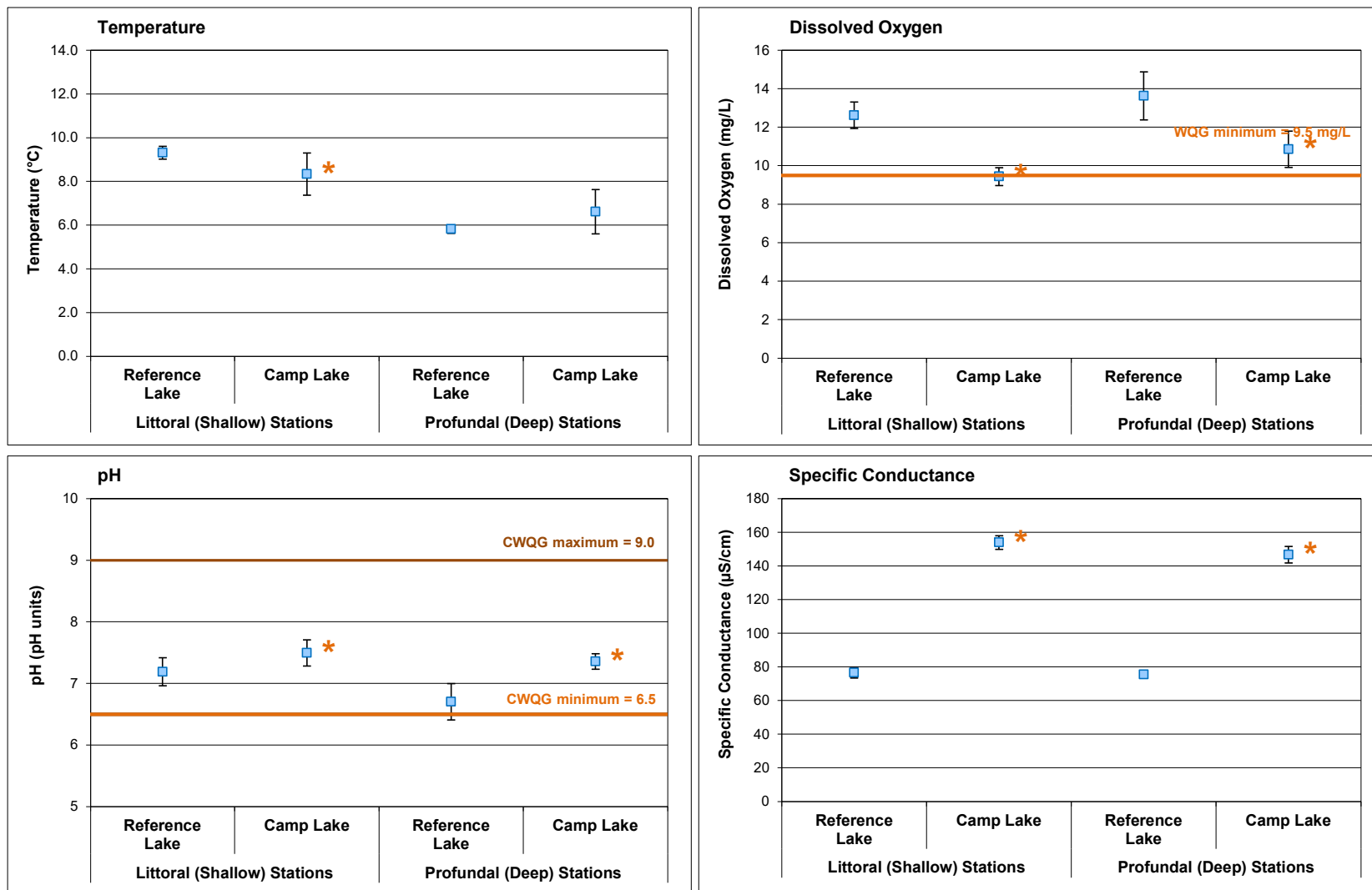


**Figure 3.6: Comparison of *In Situ* Water Quality Variables (mean  $\pm$  SD; n = 5) Measured at Camp Lake (JLO) and Reference Lake 3 (REF3) Littoral and Profundal Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: An asterisk (\*) next to data point indicates mean value differs significantly from the Reference Lake 3 mean for the respective littoral or profundal station type.

near the bottom at littoral and profundal stations of Camp Lake were significantly higher than at the reference lake during the August 2020 biological study, the mean incremental difference in pH between lakes was small (i.e., 0.6 pH units) and all pH values were consistently within WQG limits (Figure 3.6, Appendix Table C.26), suggesting that the pH difference between lakes was not ecologically meaningful. Specific conductance profiles showed no marked step changes from the surface to bottom of the Camp Lake water column, indicating the absence of chemical stratification (Figure 3.5). Specific conductance was consistently higher at Camp Lake than at Reference Lake 3 in summer and fall 2020 (Figure 3.5), the difference of which was shown to be significant during the August 2020 biological study (Figure 3.6) and possibly reflected a mine-related influence on water quality. Secchi depth readings, which serve as a proxy for water clarity, were significantly lower at Camp Lake than at Reference Lake 3 during the August 2020 biological study (Appendix Figure C.8) indicating more suspended particulate material in waters of Camp Lake.

Water chemistry at Camp Lake met all AEMP benchmarks and WQG over the duration of spring, summer, and fall sampling events in 2020 (Table 3.7). Among those parameters with established AEMP benchmarks, aluminum and chloride concentrations were moderately (i.e., 5- to 10-fold) and slightly (i.e., 3- to 5-fold) elevated, respectively, at Camp Lake compared to the reference lake (Table 3.7; Appendix Table C.27). Of those parameters without AEMP benchmarks, only total and dissolved manganese, molybdenum, and uranium concentrations were slightly elevated at Camp Lake compared to the reference lake during summer and/or fall sampling events in 2020 (Appendix Tables C.27 and C.29). Concentrations of chloride, sulphate, and total aluminum were elevated at Camp Lake in 2020 compared to baseline, though only during winter and/or summer sampling events (Appendix Figure C.9; Appendix Tables C.27 and C.29). In addition, concentrations of each of these parameters were consistently well below AEMP benchmarks since commercial mine operations commenced in 2015 (Appendix Figure C.9). Overall, comparisons to Reference Lake 3 water chemistry in 2020 and to Camp Lake baseline water chemistry suggested slightly elevated concentrations of chloride, manganese, molybdenum, and uranium at Camp Lake in 2020 which reflected a slight mine-related influence on water quality of the lake. However, because concentrations of all parameters remained well below AEMP benchmarks and WQG since commercial mine operations commenced in 2015, including in 2020, no adverse effects on biota were expected at Camp Lake.

### 3.3.2 Sediment Quality

Surficial sediment (i.e., top 2 cm) collected at the Camp Lake coring stations in 2020 was primarily composed of silt and sand with low (i.e., 0.3 to 3.4%) TOC content (Figure 3.7; Appendix Table D.15). Surficial sediment at littoral stations of Camp Lake contained significantly more sand



Table 3.7: Mean Water Chemistry at Camp Lake (JLO) and Reference Lake 3 (REF3) Monitoring Stations<sup>a</sup> During Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>b</sup> | AEMP Benchmark <sup>c</sup> | Reference Lake 3 (n = 3) |          | Camp Lake Stations (n = 5) |           |          |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|--------------------------|----------|----------------------------|-----------|----------|
|                        |                                    |         |                                            |                             | Summer                   | Fall     | Winter                     | Summer    | Fall     |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 79                       | 79       | 179                        | 154       | 142      |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.66                     | 7.75     | 7.73                       | 8.05      | 7.98     |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 35                       | 38       | 96                         | 71        | 71       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.0                      | 2.0      | 2.0                        | 2.0       | 2.0      |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 41                       | 51       | 115                        | 85        | 84       |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.15                     | 0.15     | 0.13                       | 0.78      | 0.31     |
| Nutrients and Organics | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 46                       | 34       | 80                         | 67        | 64       |
|                        | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.010                    | 0.014    | 0.019                      | 0.005     | 0.011    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                    | 0.020    | 0.054                      | 0.043     | 0.030    |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                    | 0.005    | 0.005                      | 0.001     | 0.005    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.15                     | 0.16     | 0.19                       | 0.11      | 0.16     |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.3                      | 3.5      | 2.4                        | 2.4       | 2.3      |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.6                      | 3.8      | 2.7                        | 2.0       | 2.8      |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0041                   | 0.0031   | 0.0044                     | 0.0034    | 0.0039   |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | 0.0010                   | 0.0011   | 0.0021                     | 0.0028    | 0.0013   |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | 0.1                      | 0.1      | 0.1                        | 0.05      | 0.1      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.4                      | 1.4      | 5.8                        | 4.5       | 4.5      |
| Total Metals           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 3.6                      | 3.6      | 5.1                        | 4.6       | 4.6      |
|                        | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                       | 0.0031                   | 0.0032   | 0.0119                     | 0.0162    | 0.0049   |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0001                   | 0.0001   | 0.0001                     | 0.0001    | 0.0001   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.0001                   | 0.0001   | 0.0001                     | 0.0001    | 0.0001   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0064                   | 0.0070   | 0.0089                     | 0.0074    | 0.0068   |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | 0.0005                   | 0.0005   | 0.0005                     | 0.0001    | 0.0005   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                   | 0.0005   | 0.0005                     | 0.00005   | 0.0005   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                     | 0.01     | 0.01                       | 0.01      | 0.01     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                     | 0.00001                  | 0.00001  | 0.00001                    | 0.000005  | 0.00001  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.2                      | 7.2      | 18.6                       | 14.0      | 13.7     |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.0005                   | 0.0005   | 0.0005                     | 0.000117  | 0.0005   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | 0.0001                   | 0.0001   | 0.0001                     | 0.0001    | 0.0001   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                      | 0.00073                  | 0.00075  | 0.00130                    | 0.00091   | 0.00084  |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.03                     | 0.03     | 0.03                       | 0.03      | 0.03     |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.00005                  | 0.00005  | 0.000068                   | 0.00005   | 0.00005  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                   | 0.0010   | 0.0016                     | 0.0012    | 0.0011   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.2                      | 4.7      | 11.9                       | 8.6       | 8.5      |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00080                  | 0.00068  | 0.00168                    | 0.00290   | 0.00109  |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.000005                 | 0.000005 | 0.000005                   | 0.000005  | 0.000005 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00013                  | 0.00015  | 0.00048                    | 0.00041   | 0.00037  |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                  | 0.00050  | 0.00082                    | 0.00055   | 0.00059  |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.9                      | 0.9      | 1.5                        | 1.3       | 1.2      |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.001                    | 0.001    | 0.001                      | 0.0000516 | 0.001    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.50                     | 0.50     | 0.54                       | 0.46      | 0.32     |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.00001                  | 0.00001  | 0.00001                    | 0.00001   | 0.00001  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.9                      | 1.0      | 2.6                        | 1.9       | 1.9      |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0084                   | 0.0082   | 0.0152                     | 0.0113    | 0.0102   |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.0001                   | 0.0001   | 0.0001                     | 0.00001   | 0.0001   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.0001                   | 0.0001   | 0.000104                   | 0.0001    | 0.0001   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.01                     | 0.01     | 0.01                       | 0.000763  | 0.01     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00032                  | 0.00033  | 0.00128                    | 0.00125   | 0.00120  |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | 0.0010                   | 0.001    | 0.001                      | 0.0005    | 0.001    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                   | 0.003    | 0.00582                    | 0.00529   | 0.003    |

 Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**  Indicates parameter concentration above the applicable AEMP benchmark.

<sup>a</sup> Values presented are averages from samples taken from the surface and the bottom of the water column at each lake for the indicated season.

<sup>b</sup> Canadian Water Quality Guideline (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>c</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data (2006 to 2013) specific to Camp Lake.

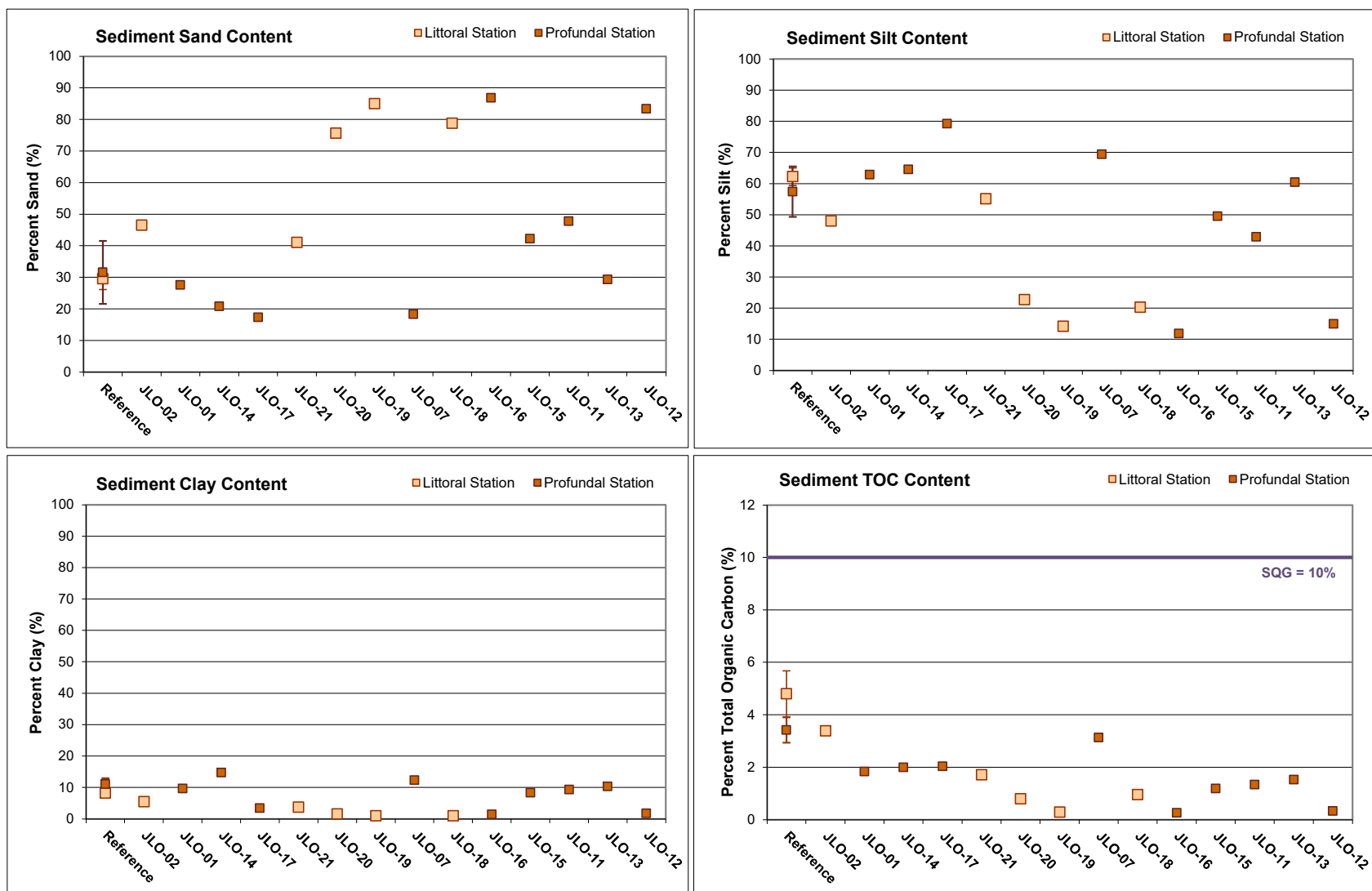


**Figure 3.7: Sediment Particle Size and Total Organic Carbon (TOC) Content Comparisons among Camp Lake (JLO) Sediment Monitoring Stations and to Reference Lake 3 Averages (mean  $\pm$  SE), Mary River Project CREMP, August 2020**



and less silt and clay compared to Reference Lake 3 whereas the particle size of sediment from profundal areas of both lakes did not differ (Appendix Table D.16). The TOC in sediment at littoral and profundal stations of Camp Lake was significantly lower, and sediment was significantly more compact (i.e., lower moisture content), than at the reference lake (Figure 3.7; Appendix Table D.16). A surficial and/or sub-surface layer of oxidized material (likely iron hydroxide or oxy-hydroxides), visible as reddish-orange to orange-brown substrate, was observed in sediments at some Camp Lake stations (Appendix Tables D.13 and D.14). Similar observations of oxidized material were made at Reference Lake 3 (Appendix Tables D.3 and D.4), suggesting the natural occurrence of iron (oxy)hydroxides in the sediment of lakes within the mine local study area. Substrates of Camp Lake exhibited minor, sporadic blackening at sediment depths greater than 2 cm and sulphidic odour was detected in sediment from some stations, suggesting occasional incidence of reducing conditions within substrates of the lake. However, no strongly defined redox boundaries were identified visually in Camp Lake sediments in 2020 (Appendix Table D.14). Qualitative observations suggestive of reducing conditions in sediment were similar between Camp Lake and Reference Lake 3 in 2020 (Appendix Tables D.3, D.4, D.13, and D.14), which indicated that factors leading to these conditions were comparable between lakes.

Evidence of slightly higher concentrations of some metals (e.g., arsenic, copper, iron, molybdenum, nickel, uranium) in sediment at stations located closer to the CLT1 inlet were indicated compared to those located near the outlet of Camp Lake in 2020 (Appendix Table D.15). However, these spatial differences in metal concentrations were most likely attributable to higher TOC and smaller particle size in sediments from stations closest to the CLT1 inlet (Appendix Table D.15) as supported by observations of no spatial changes in water chemistry within Camp Lake. Metal concentrations in littoral and profundal sediment of Camp Lake were comparable (i.e., less than a factor of 3-fold higher) to those of the reference lake in 2020 (Table 3.8; Appendix Table D.17). Iron and manganese concentrations were above their respective SQG, and arsenic, iron, and nickel concentrations were higher than the Camp Lake AEMP benchmarks, in sediment from the Camp Lake littoral station in 2020 (Table 3.8). Mean concentrations of iron and copper were also above SQG and AEMP benchmarks, respectively, in littoral sediments at Reference Lake 3 (Table 3.8). Because station JL0-02 is located near the CLT1 inlet, this suggested that mine-influenced flow from this tributary potentially contributed to higher concentrations of the metals indicated above in sediment at this location. Although the mean concentration of manganese was above the SQG in profundal sediment from Camp Lake, the mean concentration of this metal, as well as iron, were also above SQG in profundal sediment at Reference Lake 3 (Table 3.8) indicating naturally high concentrations of these metals in sediments of the study area. Concentrations of arsenic, copper, iron, manganese,



Table 3.8: Sediment Total Organic Carbon and Metal Concentrations at Camp Lake (JLO) and Reference Lake 3 (REF3) Sediment Monitoring Stations, Mary River Project CREMP, August 2020

| Analyte |                 | Units | SQG <sup>a</sup>     | AEMP Benchmark <sup>b</sup> | Littoral Stations         |                      | Profundal Stations        |                      |
|---------|-----------------|-------|----------------------|-----------------------------|---------------------------|----------------------|---------------------------|----------------------|
|         |                 |       |                      |                             | Reference Lake<br>(n = 5) | Camp Lake<br>(n = 1) | Reference Lake<br>(n = 5) | Camp Lake<br>(n = 9) |
|         |                 |       |                      |                             | Average ± SD              |                      | Average ± SD              | Average ± SD         |
| TOC     |                 | %     | 10 <sup>α</sup>      | -                           | 4.80 ± 1.96               | 3.39                 | 3.42 ± 1.08               | 1.51 ± 0.889         |
| Metals  | Aluminum (Al)   | mg/kg | -                    | -                           | 16,880 ± 1,785            | 15,500               | 21,800 ± 2,185            | 15,303 ± 5,683       |
|         | Antimony (Sb)   | mg/kg | -                    | -                           | <0.10 ± 0                 | 0.11                 | <0.10 ± 0                 | <0.10 ± 0            |
|         | Arsenic (As)    | mg/kg | 17                   | 5.9                         | 3.53 ± 1.09               | <b>9.03</b>          | 4.07 ± 0.397              | 5.54 ± 4.51          |
|         | Barium (Ba)     | mg/kg | -                    | -                           | 117 ± 22                  | 122                  | 122 ± 18                  | 82.7 ± 57.2          |
|         | Beryllium (Be)  | mg/kg | -                    | -                           | 0.65 ± 0.073              | 0.78                 | 0.80 ± 0.092              | 0.83 ± 0.33          |
|         | Bismuth (Bi)    | mg/kg | -                    | -                           | <0.20 ± 0                 | 0.29                 | <0.20 ± 0                 | 0.27 ± 0.056         |
|         | Boron (B)       | mg/kg | -                    | -                           | 12.2 ± 0.853              | 17.8                 | 14.7 ± 1.77               | 24.5 ± 10.4          |
|         | Cadmium (Cd)    | mg/kg | 3.5                  | 1.5                         | 0.173 ± 0.047             | 0.269                | 0.148 ± 0.0172            | 0.159 ± 0.074        |
|         | Calcium (Ca)    | mg/kg | -                    | -                           | 5,608 ± 1,247             | 5,650                | 5,010 ± 407               | 5,122 ± 2,362        |
|         | Chromium (Cr)   | mg/kg | 90                   | 98                          | 54.3 ± 4.40               | 66.2                 | 65.0 ± 6.64               | 64.6 ± 20.1          |
|         | Cobalt (Co)     | mg/kg | -                    | -                           | 10.8 ± 1.64               | 18.4                 | 15.2 ± 1.56               | 16.3 ± 5.62          |
|         | Copper (Cu)     | mg/kg | 110 <sup>α</sup>     | 50                          | <b>71.4</b> ± 14.2        | 49.9                 | <b>83.8</b> ± 11.1        | 39.6 ± 16.8          |
|         | Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 52,400                      | 50,600 ± 24,939           | <b>61,000</b>        | 45,080 ± 4,440            | 36,833 ± 15,000      |
|         | Lead (Pb)       | mg/kg | 91                   | 35                          | 13.8 ± 0.799              | 18.9                 | 16.7 ± 1.82               | 18.0 ± 7.48          |
|         | Lithium (Li)    | mg/kg | -                    | -                           | 26.0 ± 2.51               | 22.4                 | 33.7 ± 3.83               | 27.3 ± 10.3          |
|         | Magnesium (Mg)  | mg/kg | -                    | -                           | 11,440 ± 814              | 13,400               | 14,180 ± 1,422            | 12,476 ± 2,881       |
|         | Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 4,370                       | 579 ± 258                 | 1,410                | 1,230 ± 355               | 2,063 ± 2,299        |
|         | Mercury (Hg)    | mg/kg | 0.486                | 0.17                        | 0.0500 ± 0.0178           | 0.0530               | 0.0583 ± 0.0164           | 0.0404 ± 0.0233      |
|         | Molybdenum (Mo) | mg/kg | -                    | -                           | 4.44 ± 3.31               | 2.45                 | 2.52 ± 0.273              | 1.52 ± 1.61          |
|         | Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 72                          | 40.0 ± 3.52               | <b>72.5</b>          | 45.0 ± 4.54               | 61.0 ± 18.5          |
|         | Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 1,580                       | 1,167 ± 394               | 1,310                | 956 ± 47                  | 1,037 ± 510          |
|         | Potassium (K)   | mg/kg | -                    | -                           | 4,100 ± 453               | 4,100                | 5,338 ± 543               | 4,171 ± 1,725        |
|         | Selenium (Se)   | mg/kg | -                    | -                           | 0.73 ± 0.31               | 0.49                 | 0.61 ± 0.18               | 0.37 ± 0.135         |
|         | Silver (Ag)     | mg/kg | -                    | -                           | 0.14 ± 0.047              | 0.12                 | 0.20 ± 0.057              | 0.13 ± 0.043         |
|         | Sodium (Na)     | mg/kg | -                    | -                           | 304 ± 32                  | 203                  | 369 ± 50                  | 227 ± 125            |
|         | Strontium (Sr)  | mg/kg | -                    | -                           | 11.6 ± 1.70               | 9.87                 | 12.3 ± 1.24               | 12.4 ± 5.93          |
|         | Sulphur (S)     | mg/kg | -                    | -                           | 1,400 ± 387               | <1,000               | 1,140 ± 195               | 1,789 ± 2,367        |
|         | Thallium (Tl)   | mg/kg | -                    | -                           | 0.379 ± 0.0415            | 0.467                | 0.594 ± 0.094             | 0.435 ± 0.183        |
|         | Tin (Sn)        | mg/kg | -                    | -                           | <2.0 ± 0                  | <2.0                 | <2.0 ± 0                  | <2.0 ± 0             |
|         | Titanium (Ti)   | mg/kg | -                    | -                           | 1,006 ± 109               | 833                  | 1,136 ± 50                | 816 ± 259            |
|         | Uranium (U)     | mg/kg | -                    | -                           | 11.0 ± 2.41               | 7.39                 | 19.7 ± 3.76               | 5.04 ± 2.51          |
|         | Vanadium (V)    | mg/kg | -                    | -                           | 54.1 ± 5.40               | 54.3                 | 63.4 ± 4.89               | 52.5 ± 18.5          |
|         | Zinc (Zn)       | mg/kg | 315                  | 135                         | 73.1 ± 7.83               | 59.4                 | 83.8 ± 8.52               | 50.2 ± 19.2          |
|         | Zirconium (Zr)  | mg/kg | -                    | -                           | 4.5 ± 1.0                 | 7.8                  | 3.9 ± 0.32                | 5.4 ± 3.6            |

Indicates parameter concentration above SQG.

**BOLD**

Indicates parameter concentration above the AEMP Benchmark.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013). The indicated values are specific to Camp Lake.

nickel, and phosphorus were above respective Camp Lake AEMP benchmarks in sediment at some profundal stations of Camp Lake, but on average, were below the applicable benchmarks (Table 3.8; Appendix Table D.15). Of these metals, average concentrations of copper were also above the Camp Lake AEMP benchmark in profundal sediment at Reference Lake 3 (Table 3.8), providing further support for naturally elevated concentrations of copper in sediment.

Mean metal concentrations in sediment from Camp Lake littoral and profundal stations were comparable between 2020 and the baseline period for each respective station type (Appendix Table D.17). The only exception was a slightly higher (i.e., 3-fold greater) arsenic concentration in sediment from the single Camp Lake littoral station in 2020 (Figure 3.8; Appendix Table D.17).<sup>8</sup> Metal concentrations in sediment from Camp Lake littoral and profundal stations in 2020 were typically within the range of those observed from 2015 to 2019 (Figure 3.8). In addition, except for slightly higher mean concentrations of arsenic, calcium, and manganese, there was no evidence of consistently higher metal concentrations in Camp Lake sediments over the 2015 to 2020 period of mine operation relative to baseline (Figure 3.8). Overall, no substantial changes in sediment chemistry have been observed at Camp Lake following the commencement of mine operations in 2015.

### 3.3.3 Phytoplankton

Camp Lake chlorophyll-a concentrations showed no clear spatial gradients with distance from the CLT1 inlet to the lake outlet stations in 2020 (Figure 3.9). Chlorophyll-a concentrations were significantly lower in winter compared to summer and fall at Camp Lake in 2020 (Figure 3.9; Appendix Table E.6). Chlorophyll-a concentrations at Camp Lake did not differ significantly from those at Reference Lake 3 in the summer sampling event, but were significantly higher at Camp Lake in the fall sampling event (Appendix Tables E.7 and E.8). However, chlorophyll-a concentrations at Camp Lake were consistently well below the AEMP benchmark of 3.7 µg/L during all winter, summer, and fall sampling events in 2020 (Figure 3.9). Average chlorophyll-a concentrations at Camp Lake suggested relatively low phytoplankton abundance and an 'oligotrophic' status based on comparison to Wetzel (2001) lake trophic classifications using chlorophyll-a concentrations. This trophic status classification was also consistent with an ultra-oligotrophic to oligotrophic WQG (CCME 2020) categorization for Camp Lake based on

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<sup>8</sup> Boron concentrations in sediment from 2015 to 2020 were considerably higher (i.e., 10- to 70-fold) than those reported during both the baseline and 2014 studies at all mine-exposed lakes. The lack of any distinct gradient in the magnitude of the elevation in boron concentrations among stations within each lake and among study lakes suggested that the stark contrast in boron concentrations between recent data and data collected prior to 2015 was likely due to laboratory-based analytical differences.



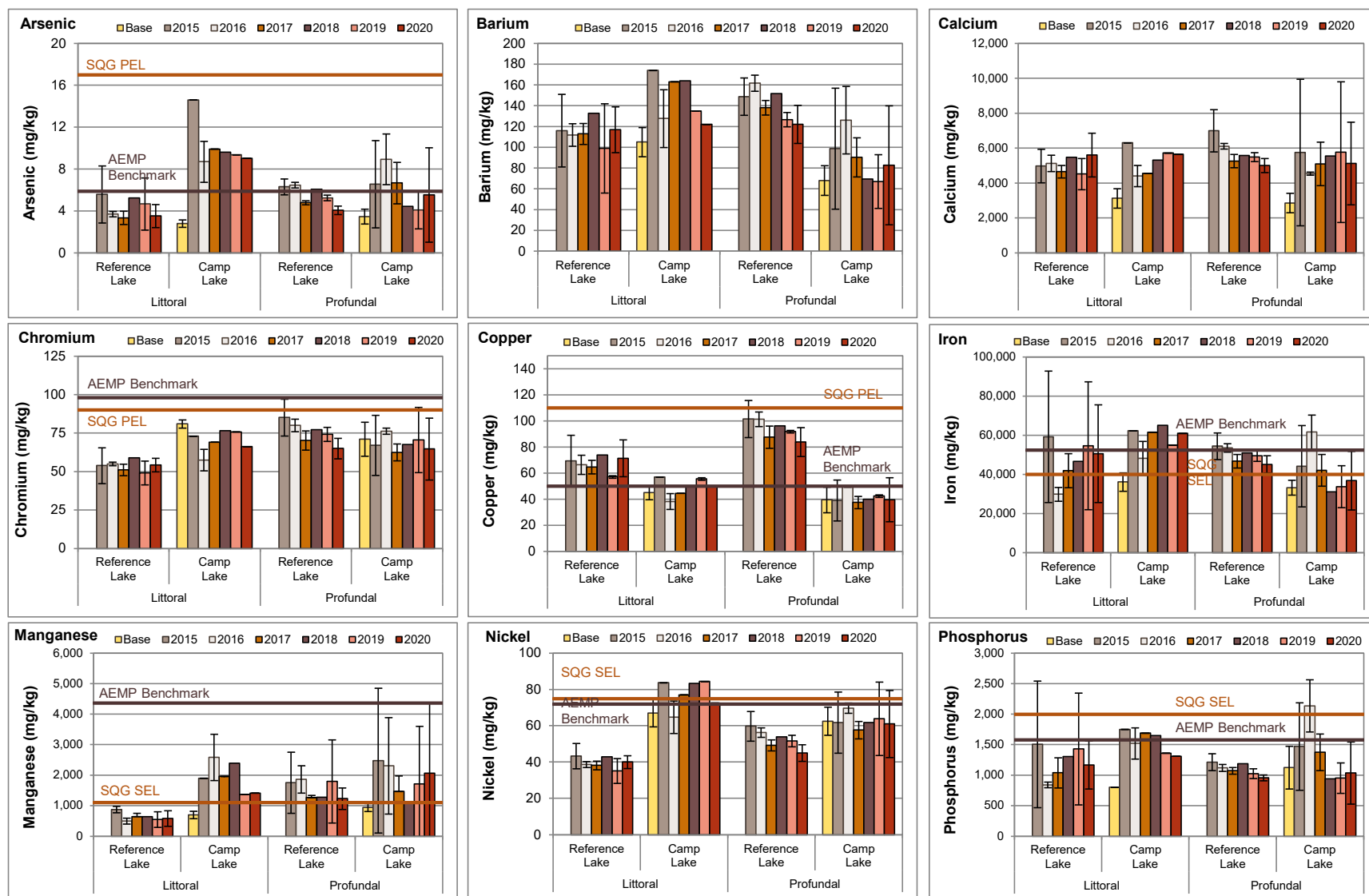


**Figure 3.8: Temporal Comparison of Sediment Metal Concentrations (mean ± SD) at Littoral and Profundal Stations of Camp Lake and Reference Lake 3 for Mine Baseline (2005 to 2013) and Operational (2015 to 2020) Periods**

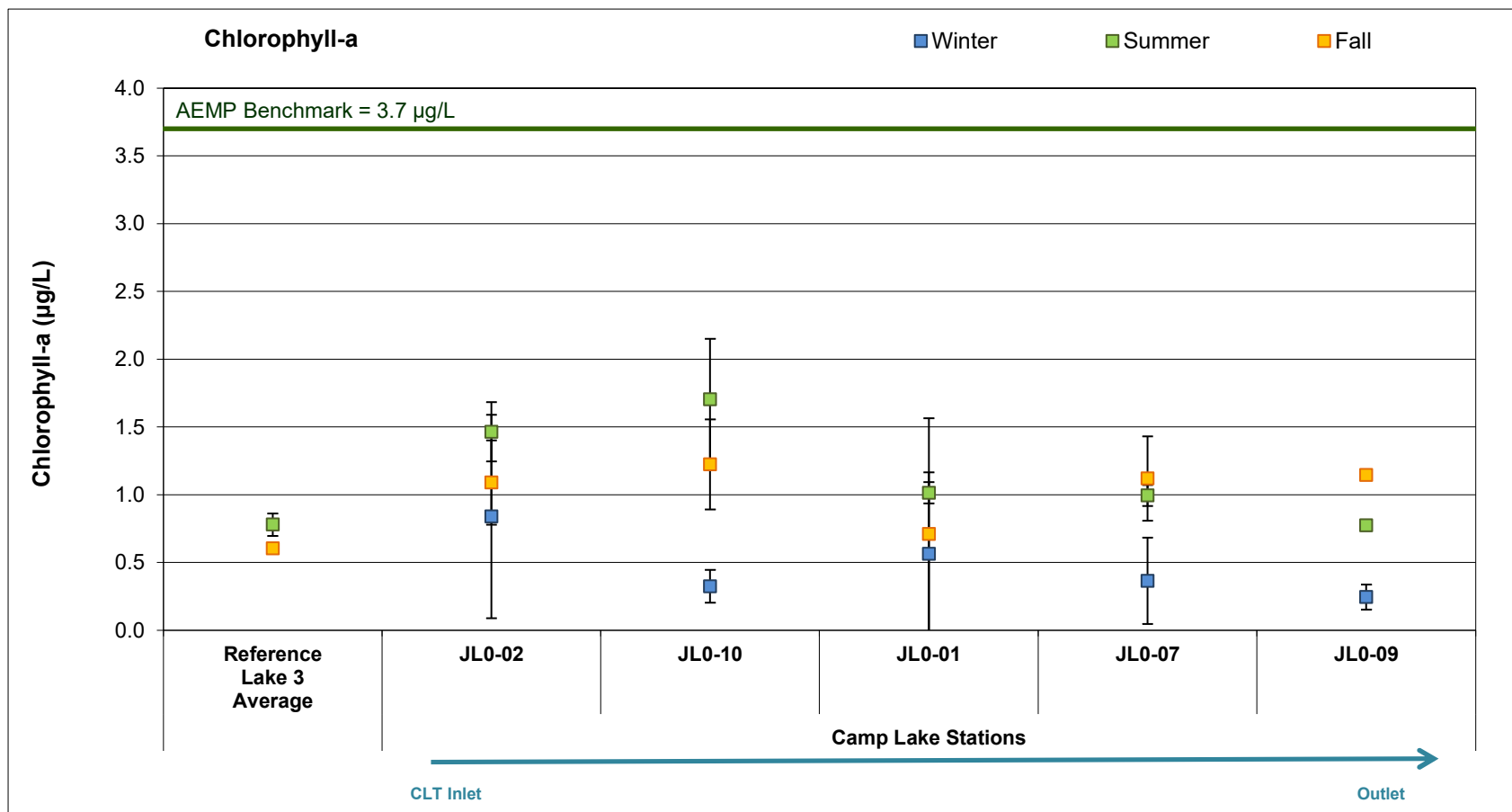


**Figure 3.9: Chlorophyll a Concentrations at Camp Lake (JLO) Phytoplankton Monitoring Stations, Mary River Project CREMP, 2020**

Notes: Values are averages of samples taken from the surface and the bottom of the water column at each station. Reference values represent mean  $\pm$  standard deviation ( $n = 3$ ). Reference Lake 3 was not sampled in winter 2020.

mean aqueous total phosphorus concentrations below 10 µg/L for all seasonal sampling events (Table 3.7; Appendix Table C.26).

Temporal comparisons of the Camp Lake chlorophyll-a data did not indicate any consistent significant differences between years of mine construction (2014) and mine operation (2015 to 2020) for seasonal data collected in winter, summer, or fall (Figure 3.10). The lack of any consistent directional changes in chlorophyll-a concentrations for any given season among years was consistent with no substantial changes in nutrient (e.g., nitrate) concentrations and water quality generally achieving WQG at Camp Lake for the six years since mine operations commenced. No chlorophyll-a baseline (2005 to 2013) data are available for Camp Lake, precluding comparisons to conditions prior to the mine construction period.

### 3.3.4 Benthic Invertebrate Community

Benthic invertebrate density was significantly higher at littoral and profundal habitat of Camp Lake compared to like-habitat stations at Reference Lake 3 (Tables 3.9 and 3.10). For both habitat types, the difference was ecologically significant based on the magnitude being outside of the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$ . No significant differences in richness or evenness were indicated between Camp Lake and the reference lake for either littoral or profundal habitat (Tables 3.9 and 3.10). Bray-Curtis Index differed significantly between Camp Lake and Reference Lake 3 for both littoral and profundal habitat types (Appendix Table F.21), indicating benthic invertebrate community structural differences between lakes. No ecologically significant differences in relative abundance of metal-sensitive Chironomidae were indicated between Camp Lake and Reference Lake 3 (Tables 3.9 and 3.10), which was consistent with metal concentrations in water and sediment of Camp Lake generally below applicable guidelines (Tables 3.7 and 3.8).<sup>9</sup> Therefore, the difference(s) in community structure between lakes appeared unrelated to metal concentrations.

The key differences in benthic invertebrate community composition between Camp Lake and Reference Lake 3 included significantly higher and lower relative abundance of Chironomidae and Ostracoda dominant groups, respectively, at littoral habitat of Camp Lake (Tables 3.9 and 3.10). No ecologically significant differences in FFGs were indicated between Camp Lake and the reference lake (Tables 3.9 and 3.10), suggesting a similar food resource base for benthic invertebrates between lakes. However, an ecologically significant higher relative abundance of the burrower HPG was present at Camp Lake compared to Reference Lake 3 (Tables 3.9

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<sup>9</sup> Although mean concentrations of iron and manganese in sediment were above SQG at Camp Lake, the concentrations of these metals in sediment of the reference lake were also above SQG (Table 3.8), indicating natural elevation of iron and manganese in lakes of the study area.





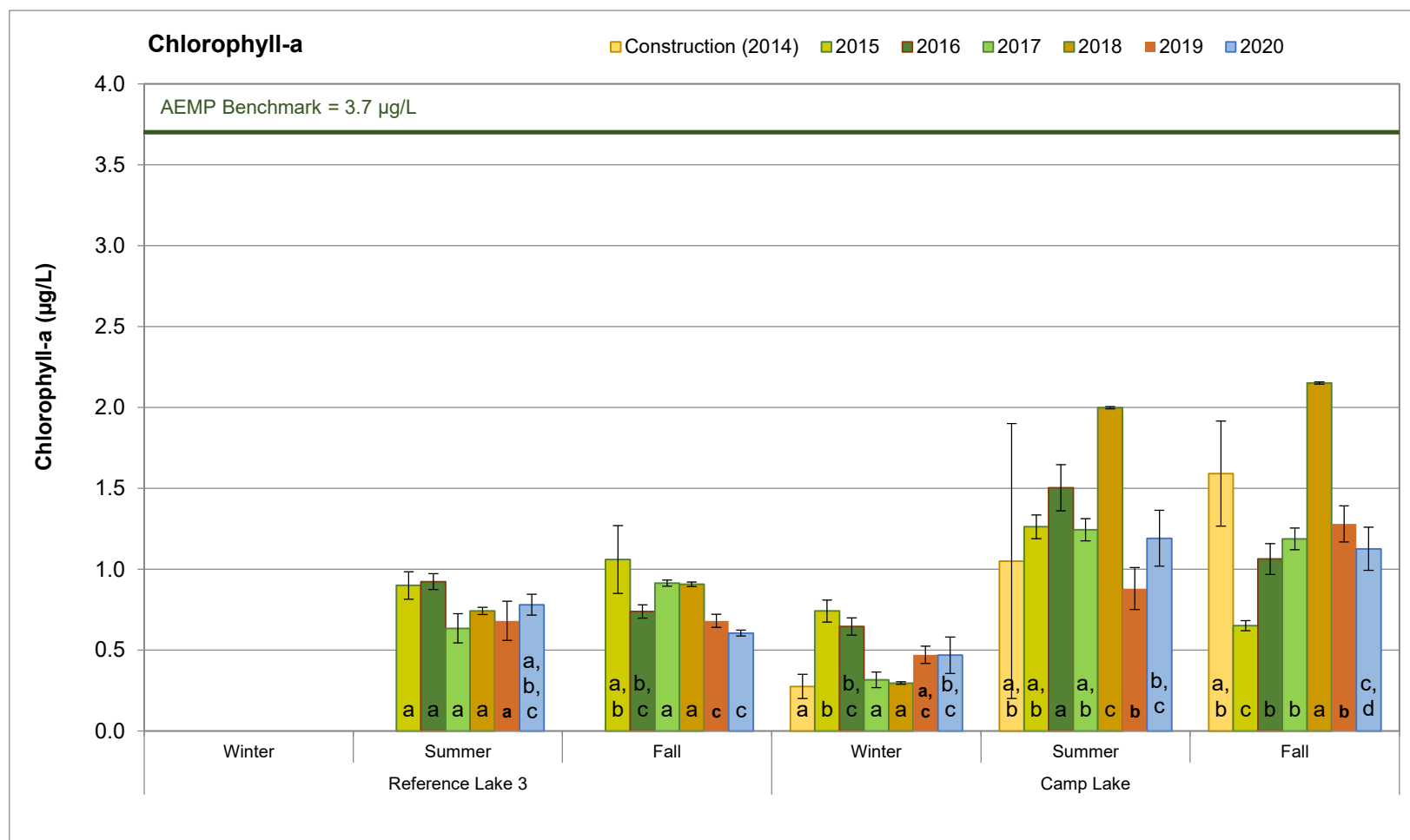


**Figure 3.10: Temporal Comparison of Chlorophyll-a Concentrations Among Seasons between Camp Lake and Reference Lake 3 for Mine Construction (2014) and Operational (2015 to 2020) Periods (mean ± SE)**

Note: Bars with the same letter at the base do not differ significantly between years for the applicable season

**Table 3.9: Benthic Invertebrate Community Statistical Comparison Results between Camp Lake (JLO) and Reference Lake 3 for Littoral Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics          |              |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|-----------------------------|--------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Littoral Habitat | Mean (n = 5) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | 0.003   | 8.3                                              | Reference Lake 3            | 1,571        | 430                | 193            | 1,190   | 1,474  | 2,310   |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 5,122        | 2,202              | 985            | 2,000   | 5,474  | 8,052   |
| Richness (Number of Taxa)             | t-equal                  | log10               | NO                                    | 0.150   | 0.8                                              | Reference Lake 3            | 14.6         | 2.5                | 1.1            | 13.0    | 14.0   | 19.0    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 16.6         | 1.7                | 0.7            | 14.0    | 17.0   | 18.0    |
| Simpson's Evenness (E)                | t-equal                  | none                | NO                                    | 0.378   | 0.3                                              | Reference Lake 3            | 0.810        | 0.110              | 0.049          | 0.630   | 0.847  | 0.923   |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 0.842        | 0.044              | 0.020          | 0.773   | 0.858  | 0.889   |
| Shannon Diversity                     | t-equal                  | log10               | NO                                    | 0.559   | 0.2                                              | Reference Lake 3            | 2.710        | 0.526              | 0.235          | 2.080   | 2.730  | 3.510   |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 2.820        | 0.129              | 0.058          | 2.700   | 2.770  | 3.010   |
| Hydracarina (%)                       | t-equal                  | log10               | NO                                    | 0.568   | -1.2                                             | Reference Lake 3            | 5.3          | 2.6                | 1.2            | 3.5     | 4.4    | 9.9     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 2.0          | 2.4                | 1.1            | 0.3     | 1.0    | 6.0     |
| Ostracoda (%)                         | Mann-Whitney             | rank                | YES                                   | 0.008   | -2.5                                             | Reference Lake 3            | 37.9         | 14.5               | 6.5            | 26.7    | 36.2   | 62.6    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 2.0          | 1.6                | 0.7            | 0.0     | 2.1    | 4.1     |
| Chironomidae (%)                      | Mann-Whitney             | rank                | YES                                   | 0.008   | 2.6                                              | Reference Lake 3            | 52.6         | 15.6               | 7.0            | 26.9    | 59.0   | 66.4    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 92.9         | 2.0                | 0.9            | 90.8    | 92.9   | 95.8    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | NO                                    | 0.882   | 0.2                                              | Reference Lake 3            | 28.8         | 9.5                | 4.3            | 15.6    | 32.5   | 38.7    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 30.3         | 19.7               | 8.8            | 9.7     | 33.7   | 56.9    |
| Collector-Gatherers (%)               | t-equal                  | log10               | NO                                    | 0.440   | -0.5                                             | Reference Lake 3            | 63.1         | 11.4               | 5.1            | 53.6    | 60.3   | 81.5    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 56.9         | 17.7               | 7.9            | 34.0    | 54.9   | 83.4    |
| Filterers (%)                         | t-equal                  | none                | NO                                    | 0.804   | 0.3                                              | Reference Lake 3            | 27.1         | 9.8                | 4.4            | 14.4    | 29.2   | 38.0    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 29.7         | 20.2               | 9.0            | 7.0     | 33.7   | 56.2    |
| Shredders (%)                         | t-unequal                | none                | YES                                   | 0.088   | -1.0                                             | Reference Lake 3            | 3.9          | 3.3                | 1.5            | 0.6     | 3.2    | 7.4     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 0.5          | 0.7                | 0.3            | 0.0     | 0.2    | 1.6     |
| Clingers (%)                          | t-equal                  | none                | NO                                    | 0.742   | -0.4                                             | Reference Lake 3            | 31.9         | 9.3                | 4.2            | 17.9    | 33.5   | 41.6    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 28.6         | 19.7               | 8.8            | 4.6     | 25.5   | 56.2    |
| Sprawlers (%)                         | t-equal                  | log10               | YES                                   | 0.046   | -1.8                                             | Reference Lake 3            | 57.9         | 12.1               | 5.4            | 41.0    | 57.2   | 73.8    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 36.7         | 17.8               | 8.0            | 22.0    | 26.6   | 65.0    |
| Burrowers (%)                         | t-equal                  | log10               | YES                                   | 0.002   | 5.0                                              | Reference Lake 3            | 10.2         | 4.9                | 2.2            | 4.6     | 8.3    | 17.3    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Littoral          | 34.7         | 12.5               | 5.6            | 21.8    | 31.1   | 55.3    |

Grey shading indicates statistically significant difference between study areas based on p-values ≤ 0.10.

Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

**Table 3.10: Benthic Invertebrate Community Statistical Comparison Results between Camp Lake (JLO) and Reference Lake 3 for Profundal Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics           |              |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|------------------------------|--------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Profundal Habitat | Mean (n = 5) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | 0.005   | 6.4                                              | Reference Lake 3             | 479          | 142                | 63             | 336     | 491    | 681     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 1,383        | 656                | 293            | 621     | 1,138  | 2,345   |
| Richness (Number of Taxa)             | t-equal                  | log10               | NO                                    | 0.125   | 1.8                                              | Reference Lake 3             | 7.0          | 1.9                | 0.8            | 5.0     | 8.0    | 9.0     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 10.4         | 4.5                | 2.0            | 7.0     | 8.0    | 18.0    |
| Simpson's Evenness (E)                | t-equal                  | log10               | NO                                    | 0.346   | -1.3                                             | Reference Lake 3             | 0.731        | 0.045              | 0.020          | 0.689   | 0.721  | 0.795   |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 0.673        | 0.151              | 0.068          | 0.512   | 0.643  | 0.901   |
| Shannon Diversity                     | t-equal                  | log10               | NO                                    | 0.623   | 1.2                                              | Reference Lake 3             | 1.800        | 0.196              | 0.088          | 1.580   | 1.720  | 2.030   |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 2.040        | 0.750              | 0.336          | 1.350   | 2.000  | 3.280   |
| Hydracarina (%)                       | t-equal                  | log10(x+1)          | NO                                    | 0.494   | -0.5                                             | Reference Lake 3             | 2.8          | 2.0                | 0.9            | 0.0     | 3.5    | 5.1     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 1.9          | 2.2                | 1.0            | 0.0     | 1.4    | 5.6     |
| Ostracoda (%)                         | t-equal                  | log10(x+1)          | NO                                    | 0.386   | -0.8                                             | Reference Lake 3             | 8.6          | 4.1                | 1.8            | 3.5     | 7.7    | 14.5    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 5.5          | 7.1                | 3.2            | 0.0     | 1.5    | 17.3    |
| Chironomidae (%)                      | t-equal                  | none                | NO                                    | 0.484   | 0.7                                              | Reference Lake 3             | 87.9         | 4.2                | 1.9            | 82.3    | 87.2   | 92.7    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 91.0         | 8.4                | 3.8            | 77.6    | 90.8   | 98.5    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | YES                                   | 0.049   | -1.1                                             | Reference Lake 3             | 31.5         | 17.6               | 7.9            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 11.9         | 6.9                | 3.1            | 1.9     | 11.1   | 18.5    |
| Collector-Gatherers (%)               | t-equal                  | log10               | YES                                   | 0.020   | 1.6                                              | Reference Lake 3             | 62.9         | 15.0               | 6.7            | 45.4    | 56.1   | 79.0    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 87.0         | 9.5                | 4.3            | 75.1    | 90.1   | 99.3    |
| Filterers (%)                         | t-equal                  | none                | YES                                   | 0.037   | -1.2                                             | Reference Lake 3             | 30.7         | 17.5               | 7.8            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 9.4          | 7.4                | 3.3            | 0.4     | 9.1    | 18.5    |
| Shredders (%)                         | t-unequal                | log10(x+1)          | NO                                    | 0.119   | -0.9                                             | Reference Lake 3             | 2.2          | 2.3                | 1.0            | 0.0     | 2.5    | 5.3     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 0.2          | 0.5                | 0.2            | 0.0     | 0.0    | 1.1     |
| Clingers (%)                          | t-equal                  | none                | YES                                   | 0.046   | -1.2                                             | Reference Lake 3             | 33.5         | 16.9               | 7.6            | 13.1    | 41.5   | 52.8    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 12.4         | 10.6               | 4.8            | 0.4     | 15.4   | 25.5    |
| Sprawlers (%)                         | t-unequal                | log10               | NO                                    | 0.267   | -0.9                                             | Reference Lake 3             | 64.8         | 16.2               | 7.2            | 45.5    | 58.5   | 87.0    |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 50.0         | 40.2               | 18.0           | 12.3    | 40.1   | 93.0    |
| Burrowers (%)                         | t-unequal                | log10(x+1)          | YES                                   | 0.057   | 12.4                                             | Reference Lake 3             | 1.7          | 2.9                | 1.3            | 0.0     | 0.0    | 6.7     |
|                                       |                          |                     |                                       |         |                                                  | Camp Lake Profundal          | 37.5         | 32.3               | 14.4           | 5.6     | 34.4   | 72.3    |

Grey shading indicates statistically significant difference between study areas based on p-values ≤ 0.10.

Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

and 3.10). This difference in HPG between lakes may have reflected the occurrence of more compact (i.e., lower moisture content), sandier sediment at Camp Lake (Appendix Table F.18). Substrate compactness is an important factor influencing inhabitation by burrowing invertebrates (Ward 1992), and thus greater substrate compactness may have accounted for the subtle benthic invertebrate community assemblage differences at Camp Lake compared to Reference Lake 3. Overall, markedly higher benthic invertebrate density without accompanying differences in richness, evenness, and FFG at Camp Lake compared to Reference Lake 3 suggested that Camp Lake was more biologically productive.

No consistent significant differences in general community effect indicators of density, richness, and evenness were indicated at littoral and profundal habitats of Camp Lake over years of mine operation (2015 to 2020) compared to baseline (2007, 2013; Appendix Tables F.22 and F.23; Appendix Figures F.5 and F.6). Similarly, benthic invertebrate dominant taxonomic groups and FFGs over years of mine operation from 2015 to 2020 did not differ significantly from baseline at littoral habitat at Camp Lake (Appendix Table F.22). At profundal habitat of Camp Lake, the relative abundance of metal-sensitive chironomids and the filterer FFG were routinely significantly lower at magnitudes outside of the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$  over years of mine operation compared to the 2007 baseline data, but not to the 2013 baseline data (Appendix Table F.23). This indicated that the study-to-study differences in community features at profundal stations of Camp Lake were likely the result of sampling artifacts (e.g., differences in sampling station locations and/or replication among studies) or natural temporal variability among studies and was not related to potential influences from mine operation. Therefore, consistent with only minor changes in water and sediment quality since the mine baseline period, no ecologically significant differences in benthic invertebrate community features were indicated at littoral and profundal habitat of Camp Lake following the commencement of commercial mine operation in 2015.

### 3.3.5 Fish Population

#### 3.3.5.1 Camp Lake Fish Community

The fish community at Camp Lake was composed of arctic charr (*Salvelinus alpinus*) and ninespine stickleback (*Pungitius*; Table 3.11), reflecting the same fish species observed previously (Minnow 2020). Higher CPUE for arctic charr and ninespine stickleback occurred at Camp Lake compared to Reference Lake 3 suggesting greater densities of both species at Camp Lake (Table 3.11). The higher density of fish at Camp Lake compared to Reference Lake 3 may be linked to greater productivity within Camp Lake based on higher chlorophyll-a concentrations in water (indicative of greater phytoplankton density) and greater benthic invertebrate density. Electrofishing CPUE for arctic charr at Camp Lake in 2020 was within the range observed during baseline studies (2007 to 2013) and over the five previous years



**Table 3.11: Fish Catch and Community Summary from Backpack Electrofishing and Gill Netting Conducted at Camp Lake (JLO) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

| Lake             | Method <sup>a</sup> |            | Arctic Charr | Ninespine Stickleback | Total by Method | Total No. of Species |
|------------------|---------------------|------------|--------------|-----------------------|-----------------|----------------------|
| Reference Lake 3 | Electrofishing      | No. Caught | 134          | 1                     | 135             | 2                    |
|                  |                     | CPUE       | 2.09         | 0.016                 | 2.11            |                      |
|                  | Gill netting        | No. Caught | 69           | 0                     | 69              |                      |
|                  |                     | CPUE       | 0.956        | 0                     | 0.956           |                      |
| Camp Lake        | Electrofishing      | No. Caught | 109          | 18                    | 127             | 2                    |
|                  |                     | CPUE       | 4.93         | 0.814                 | 5.75            |                      |
|                  | Gill netting        | No. Caught | 94           | 0                     | 94              |                      |
|                  |                     | CPUE       | 14.8         | 0                     | 14.8            |                      |

<sup>a</sup> Catch-per-unit-effort (CPUE) for electrofishing represents the number of fish captured per electrofishing minute, and for gill netting represents the number of fish captured per 100 m hours of net deployed.

since mine operation commenced (Figure 3.11). In contrast, the CPUE associated with gill netting at Camp Lake in 2020 was substantially greater than baseline and earlier years of mine operations (Figure 3.12). An increase in the gill netting CPUE (almost three times greater than 2019) was also observed at Reference Lake 3 in 2020 (Figure 3.11). Higher gill netting CPUE in 2020 at both Camp Lake and Reference Lake 3 compared to previous studies likely reflected slightly earlier sampling timing in 2020 which, due to warmer water temperatures, may have resulted in greater fish movement and thus higher catches. Because electrofishing is an 'active' fish collection method, the similarity in electrofishing CPUE between 2020 and baseline, and between 2020 and other years of mine operation, suggested no substantial changes in within-lake fish densities at either lake and supported the notion that slight difference in sampling timing among years likely accounted for higher gill netting CPUE in 2020.

### 3.3.5.2 Camp Lake Fish Population Assessment

#### Nearshore Arctic Charr

A total of 100 arctic charr were sampled from the nearshore habitat of each of Camp Lake and Reference Lake 3 in August 2020. Arctic charr YOY were distinguished from older (non-YOY) age classes at both lakes using a fork length of 4.3 cm based on the evaluation of length-frequency distributions coupled with supporting age determinations (Figure 3.12; Appendix Tables G.4 and G.5) and historical evaluations (Minnow 2020). Due to limited capture of YOY in Camp Lake (i.e., only 2 of 100 individuals), statistical comparisons focused only on non-YOY individuals. The length-frequency distribution for the nearshore arctic charr differed significantly between Camp Lake and Reference Lake 3 (Table 3.12; Appendix Table G.6) based on fewer YOY and smaller-sized individuals captured at Camp Lake (Figure 3.12). Non-YOY arctic charr from Camp Lake were significantly longer (8%) and heavier (44%) than those from Reference Lake 3 (Table 3.12; Appendix Table G.6). Condition (i.e., weight-at-length) of non-YOY was significantly greater for arctic charr captured at Camp Lake than those from the reference lake, although the magnitude of this difference (7%) was within the CES of  $\pm 10\%$  (referred to herein as CES<sub>c</sub>), suggesting that this difference was not ecologically significant (Table 3.12; Appendix Table G.6).

Arctic charr non-YOY at Camp Lake were almost consistently significantly longer and heavier than at Reference Lake 3 from 2015 to 2020, indicating consistent presence of larger juveniles at Camp Lake (Table 3.12). In contrast, condition of non-YOY arctic charr showed no consistent differences, and no consistent direction of differences, between Camp Lake and the reference lake from 2015 to 2020 (Table 3.12) suggesting no appreciable differences in fish health between lakes. The length-frequency distribution of non-YOY arctic charr collected from nearshore habitats in 2020 differed from the (2013) baseline study at Camp Lake (Table 3.12).





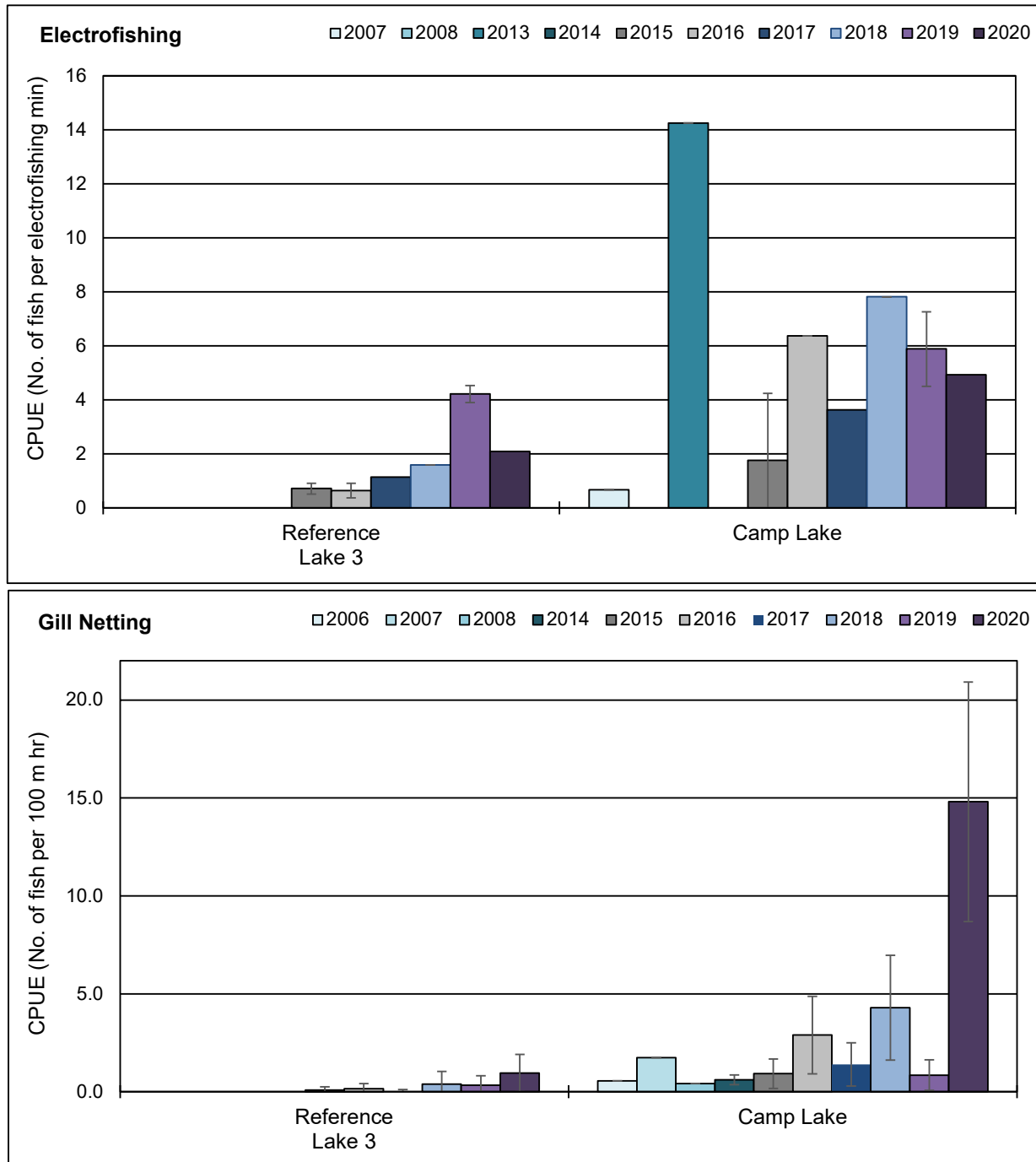


**Figure 3.11: Catch-per-unit-effort (CPUE; mean  $\pm$  SD) of Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Camp Lake (JLO) and Reference Lake 3 (REF3), Mary River Project CREMP, 2006 to 2020**

Note: Data presented for fish sampling conducted in fall during baseline (2006, 2007, 2008, 2013), construction (2014) and operational (2015 to 2020) mine phases.

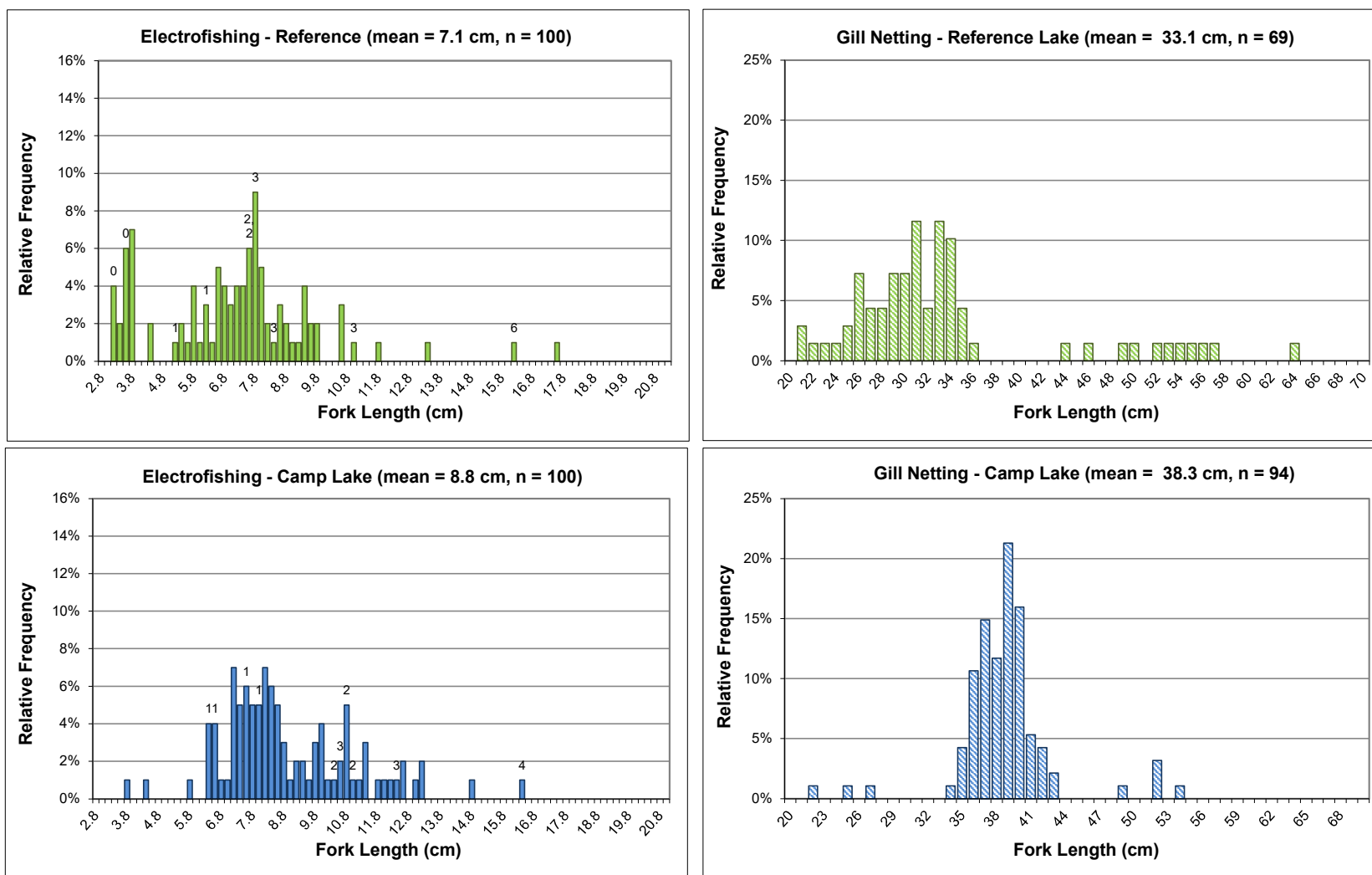


**Figure 3.12: Length-Frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Camp Lake (JLO) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

Note: Fish ages are shown above the bars, where available.

**Table 3.12: Summary of Statistical Results for Arctic Charr Population Comparisons between Camp Lake and Reference Lake 3 from 2015 to 2020, and between Camp Lake Mine Operational and Baseline Period Data, for Fish Captured by Electrofishing and Gill Netting Methods, Mary River Project CREMP**

| Data Set by Sampling Method                  | Response Category        | Endpoint                               | Statistically Significant Differences Observed? <sup>a</sup> |           |            |             |             |             |                                                    |            |            |            |            |            |
|----------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------------------------|-----------|------------|-------------|-------------|-------------|----------------------------------------------------|------------|------------|------------|------------|------------|
|                                              |                          |                                        | versus Reference Lake 3                                      |           |            |             |             |             | versus Camp Lake baseline period data <sup>b</sup> |            |            |            |            |            |
|                                              |                          |                                        | 2015                                                         | 2016      | 2017       | 2018        | 2019        | 2020        | 2015                                               | 2016       | 2017       | 2018       | 2019       | 2020       |
| Nearshore Electrofishing                     | Survival                 | Length-Frequency Distribution          | Yes                                                          | Yes       | Yes        | Yes         | Yes         | Yes         | Yes                                                | Yes        | Yes        | Yes        | No         | Yes        |
|                                              |                          | Age                                    | No                                                           | No        | No         | -           | -           | -           | -                                                  | -          | -          | -          | -          | -          |
|                                              | Energy Use (non-YOY)     | Size (mean fork length)                | Yes (+41%)                                                   | No        | Yes (+17%) | Yes (+40%)  | Yes (+10%)  | Yes (+8%)   | Yes (-15%)                                         | Yes (-32%) | Yes (-35%) | Yes (-28%) | No         | Yes (-22%) |
|                                              |                          | Size (mean weight)                     | Yes (+176%)                                                  | No        | Yes (+51%) | Yes (+135%) | Yes (+29%)  | Yes (+44%)  | Yes (-42%)                                         | Yes (-71%) | Yes (-74%) | Yes (-56%) | No         | Yes (-52%) |
|                                              | Energy Storage (non-YOY) | Condition (body weight-at-fork length) | No                                                           | Yes (-6%) | No         | Yes (-14%)  | Yes (-7%)   | Yes (+7%)   | Yes (-6%)                                          | Yes (-10%) | Yes (-10%) | Yes (-9%)  | Yes (-11%) | No         |
| Littoral/Profundal Gill Netting <sup>c</sup> | Survival                 | Length Frequency Distribution          | -                                                            | -         | -          | Yes         | Yes         | Yes         | Yes                                                | Yes        | Yes        | Yes        | Yes        | Yes        |
|                                              |                          | Age                                    | -                                                            | -         | -          | -           | -           | -           | Yes (+48%)                                         | Yes (+58%) | Yes (+46%) | -          | -          | -          |
|                                              | Energy Use               | Size (mean fork length)                | -                                                            | -         | -          | Yes (+10%)  | Yes (+28%)  | Yes (+24%)  | Yes (+6%)                                          | No         | Yes (+12%) | Yes (+15%) | Yes (+17%) | Yes (+19%) |
|                                              |                          | Size (mean weight)                     | -                                                            | -         | -          | Yes (+46%)  | Yes (+130%) | Yes (+129%) | No                                                 | No         | Yes (+37%) | Yes (+46%) | Yes (+44%) | Yes (+47%) |
|                                              | Energy Storage           | Condition (body weight-at-fork length) | -                                                            | -         | -          | Yes (+12%)  | Yes (+6%)   | Yes (+18%)  | No                                                 | Yes (-3%)  | No         | No         | No         | No         |

**BOLD** indicates a significant difference related to the comparison.

<sup>a</sup> Values in parentheses indicate direction and magnitude of any significant differences.

<sup>b</sup> Baseline period data included 2013 nearshore electrofishing data and 2006, 2008, and 2013 littoral/profundal gill netting data. nc = non-calculable magnitude.

<sup>c</sup> Due to low catches of arctic charr in gill nets at Reference Lake 3 in 2015, 2016, and 2017, no comparison of fish health was conducted for gill netted fish.

Similar to most previous years of mine operation, non-YOY arctic charr from Camp Lake were significantly shorter and lighter in 2020 than during baseline, but unlike most years, showed no difference in condition between 2020 and baseline (Table 3.12; Appendix Table G.7). Overall, the absence of consistent differences in non-YOY condition between Camp Lake and Reference Lake 3 since 2015, and occurrence of differences near ecologically meaningful thresholds in non-YOY condition at Camp Lake between mine operational and baseline studies, suggested no effects on the health of non-YOY arctic charr at Camp Lake since mine operations commenced in 2015.

### **Littoral/Profundal Arctic Charr**

A total of 94 and 69 arctic charr were sampled from littoral/profundal habitat of Camp Lake and Reference Lake 3, respectively, in August 2020. The length-frequency distribution for littoral/profundal arctic charr differed significantly between Camp Lake and Reference Lake 3, reflecting the occurrence of relatively larger fish at Camp Lake (Table 3.12; Figure 3.12). Littoral/profundal arctic charr from Camp Lake were significantly longer (24%) and heavier (129%) and had greater body condition (18%) than those captured at the reference lake (Table 3.12; Appendix Table G.6). The absolute magnitude of difference in condition between Camp Lake and Reference Lake 3 was greater than the  $CES_c$  of 10%, suggesting an ecologically significant difference. Larger body size and greater body condition of littoral/profundal arctic charr at Camp Lake relative to Reference Lake 3 were consistent with results in the two previous years (Table 3.12), suggesting an on-going difference between these populations.

A significant difference in length-frequency distribution of littoral/profundal arctic charr from Camp Lake was observed between 2020 and the combined baseline data set (i.e., 2006, 2007, and 2008 studies; Table 3.12). Although fork length and body weight were significantly greater for littoral/profundal arctic charr captured at Camp Lake in 2020 and most other years in which the mine was operational compared to the baseline period, no significant differences in body condition have generally been indicated since 2015 (Table 3.12). The occurrence of consistently larger littoral/profundal arctic charr at Camp Lake during mine operational years compared to the reference lake and Camp Lake baseline data, as well as greater condition and no differences in condition in littoral/profundal arctic charr compared to the reference lake and Camp Lake baseline data, respectively, collectively indicated no effects on the health of spawning-sized arctic charr at Camp Lake since mine operations commenced in 2015.

### **3.3.6 Effects Assessment and Recommendations**

At Camp Lake, the following AEMP benchmarks were exceeded in 2020:



- Arsenic concentration in sediment was greater than the benchmark of 5.9 mg/kg at the single Camp Lake littoral monitoring station (JL0-02);
- Iron concentration in sediment was greater than the benchmark of 52,400 mg/kg at the single Camp Lake littoral monitoring station (JL0-02);
- Nickel concentration in sediment was greater than the benchmark of 72 mg/kg at the single Camp Lake littoral monitoring station (JL0-02); and,
- Arsenic, copper, iron, manganese, nickel, and phosphorus concentrations in sediment were above respective benchmarks at individual stations, but on average were below these benchmarks among the Camp Lake profundal stations.

Arsenic concentrations in sediment at the Camp Lake littoral station in 2020 were markedly higher than at the reference lake and compared to baseline, but showed no substantial change from 2015 to 2020 suggesting no on-going source of arsenic to sediment at this station. Although iron concentrations in sediment at the Camp Lake littoral station in 2020 were elevated compared to baseline, similar concentrations of iron were observed in littoral sediment at the reference lake suggesting naturally high background concentrations. Similarly, although nickel concentrations in sediment at the Camp Lake littoral station were elevated compared to concentrations at the reference lake in 2020, no substantial change in nickel concentrations had occurred between 2020 and baseline. At profundal habitat of Camp Lake in 2020, mean concentrations of arsenic, copper, iron, manganese, nickel, and phosphorus in sediment were all comparable to mean concentrations observed at the reference lake, as well as to Camp Lake baseline data, suggesting no changes over time. Thus, only the concentration of arsenic at the Camp Lake littoral station in 2020 was elevated compared to concentrations observed in sediment both at the reference lake in 2020 and at the Camp Lake littoral station at the time of baseline.

No AEMP water quality benchmarks were exceeded at Camp Lake during spring, summer, or fall sampling events in 2020.<sup>10</sup> In addition, no adverse effects on phytoplankton, benthic invertebrates, nor on fish (arctic charr) health were indicated at Camp Lake in 2020 based on comparisons to reference lake conditions and to Camp Lake baseline data. Considering these results within the Mary River Project AEMP Management Response Framework, the potential change in arsenic concentrations in sediment at the littoral station of Camp Lake warrants a low action response. Arsenic concentrations in water at CLT1, CLT2, and Camp Lake have consistently been near or below laboratory Method Detection Limits (MDL) since 2015, and thus

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<sup>10</sup> The reported concentration of zinc at the Station JL0-07 surface was above the AEMP benchmark during the summer sampling event but this result appeared to be an anomaly based on an order of magnitude difference in concentration between this station and data reported for all other Camp Lake stations in summer 2020 (Appendix Table C.26).



the mine did not appear to be a source of arsenic to the Camp Lake system. Under the current AEMP, sediment chemistry sampling is conducted only at a single littoral station at Camp Lake (Baffinland 2015), and therefore the current AEMP does not adequately capture variability in sediment chemistry at littoral habitat of Camp Lake. Moreover, sediment chemistry sampling under the current AEMP is not always conducted at the same locations at which benthic invertebrate community sampling is conducted, precluding linkages to be drawn between sediment chemistry and biological responses. Accordingly, as per recommendations provided in the past by Minnow (2016b), a low action response of harmonizing lake sediment quality and benthic invertebrate monitoring stations, focusing primarily on littoral habitat, is recommended to improve the ability of the program to evaluate mine-related effects to biota and potentially allow linkages to be determined between metal concentrations in sediment and benthic invertebrate responses.





## 4 SHEARDOWN LAKE SYSTEM

### 4.1 Sheardown Lake Tributaries (SDLT1, SDLT12, and SDLT9)

#### 4.1.1 Water Quality

Dissolved oxygen was consistently near full saturation at each of the Sheardown Lake tributaries during spring, summer, and fall sampling events in 2020 (Appendix Tables C.1 to C.3). Dissolved oxygen concentrations at Sheardown Lake Tributary 1 (SDLT1) and Sheardown Lake Tributary 9 (SDLT9) did not differ significantly from those at Unnamed Reference Creek during the August 2020 biological study (Figure 4.1). Although dissolved oxygen concentrations were significantly lower at Sheardown Lake Tributary 12 (SDLT12) than at Unnamed Reference Creek, the dissolved oxygen concentrations at SDLT12, and both other Sheardown Lake tributaries, were well above the WQG minimum for supporting sensitive life stages of cold-water biota (i.e., 9.5 mg/L) during the August 2020 biological study (Figure 4.1; Appendix Table C.31). *In situ* pH was significantly higher at SDLT1 and SDLT12 compared to Unnamed Reference Creek, whereas pH at SDLT9 did not differ significantly from that at the reference creek during the August 2020 biological study (Figure 4.1). Despite minor differences in pH among the Sheardown Lake tributaries, pH was consistently within WQG limits at each of the Sheardown Lake tributaries and thus slight dissimilarity in pH among areas was unlikely to be ecologically meaningful. Specific conductance at each of the Sheardown Lake tributaries was significantly higher than at Unnamed Reference Creek during the August 2020 biological study (Figure 4.1; Appendix Table C.32). Because specific conductance often serves as an indication of mine-associated influences on water quality (e.g., Environment Canada 2012), these observations suggested a potential mine-related influence on water quality of the SDLT1, SDLT9, and SDLT12 watercourses.

Sheardown Lake Tributary 1 (SDLT1) is the only tributary of the Sheardown Lake system at which routine water chemistry monitoring is conducted, with one monitoring station established in each of the upper and lower reaches of the tributary (i.e., Stations D1-05 and D1-00, respectively; Figure 2.2). Water chemistry of SDLT1 met AEMP benchmarks and WQG in spring, summer, and fall sampling events of 2020 except copper concentrations, which on average were elevated relative to both criteria for all sampling events (Table 4.1; Appendix Table C.33). Among parameters with established AEMP benchmarks, mean chloride, copper, nitrate, and sulphate concentrations were elevated at SDLT1 compared to the reference creeks during at least one sampling event in 2020, with nitrate and sulphate elevated by greatest factors (Table 4.1; Appendix Table C.35). For parameters without AEMP benchmarks, concentrations of total and dissolved molybdenum, potassium, and uranium, and concentrations of dissolved manganese,



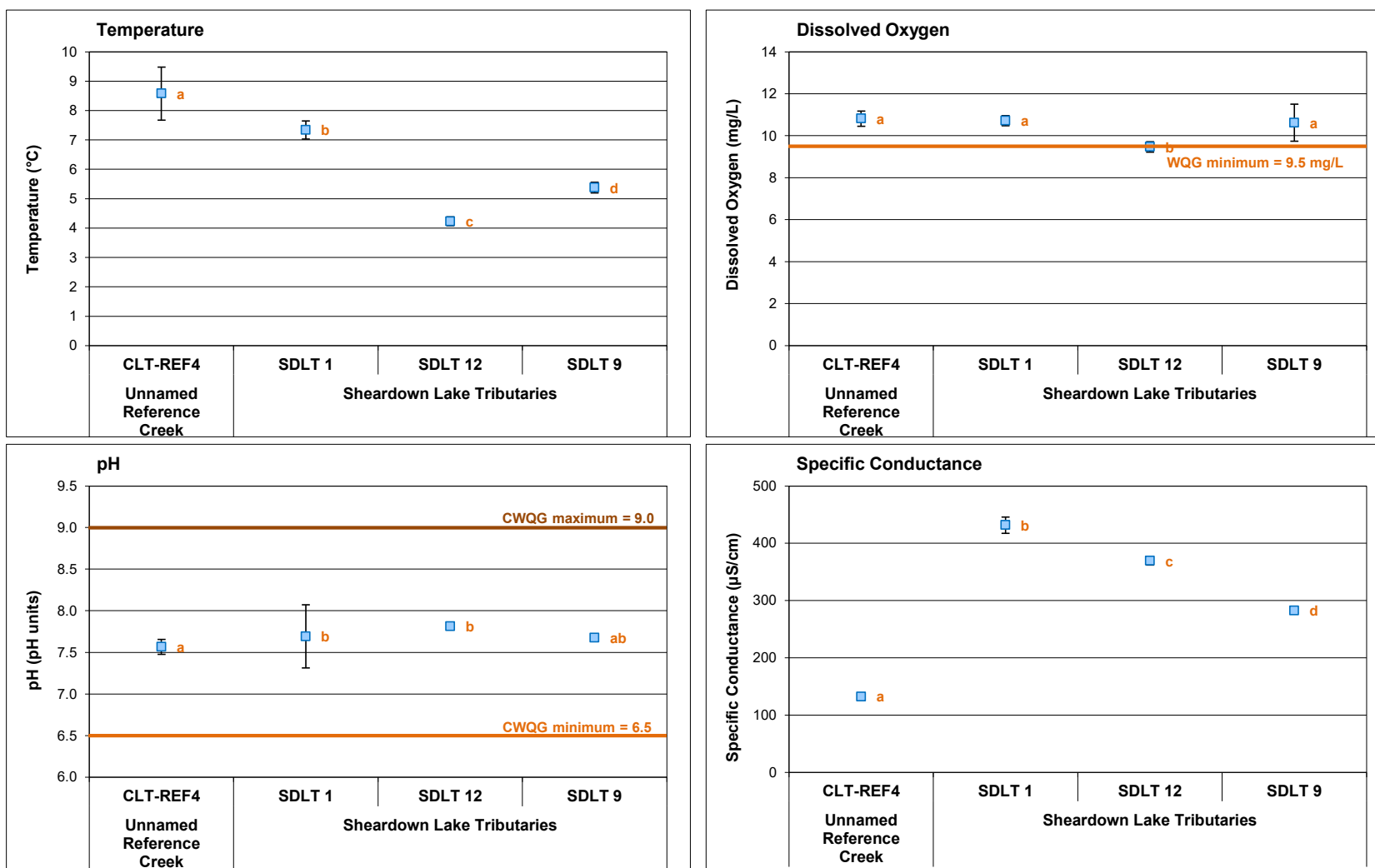


**Figure 4.1: Comparison of *In Situ* Water Quality Variables (mean  $\pm$  SD; n = 5) Measured at Sheardown Lake Tributaries (SDLT) and Unnamed Reference Creek Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: The same letter(s) next to data points indicate study area values do not differ significantly.

Table 4.1: Mean Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Monitoring Stations in Spring, Summer, and Fall, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Bench-mark <sup>b</sup> | Reference Creek (n = 4) |              |          | Sheardown Lake Tributary 1 (n = 2) |               |               |
|---------------------------|------------------------------------|---------|--------------------------------------------|------------------------------|-------------------------|--------------|----------|------------------------------------|---------------|---------------|
|                           |                                    |         |                                            |                              | Spring                  | Summer       | Fall     | Spring                             | Summer        | Fall          |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                            | 55                      | 134          | 175      | 217                                | 338           | 309           |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                            | 7.63                    | 8.01         | 8.05     | 8.07                               | 7.94          | 8.07          |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                            | 24                      | 57           | 83       | 100                                | 152           | 155           |
|                           | Total Suspended Solids             | mg/L    | -                                          | -                            | 3.2                     | 2.7          | 2        | 2.6                                | 2             | 2             |
|                           | Total Dissolved Solids             | mg/L    | -                                          | -                            | 85                      | 85           | 99       | 122                                | 198           | 172           |
|                           | Turbidity                          | NTU     | -                                          | -                            | 1.87                    | 6.62         | 2.49     | 5.37                               | 0.57          | 0.20          |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                            | 24                      | 61           | 69       | 74                                 | 112           | 111           |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                        | 0.010                   | 0.012        | 0.010    | 0.010                              | 0.010         | 0.010         |
|                           | Nitrate                            | mg/L    | 3                                          | 3                            | 0.020                   | 0.062        | 0.076    | 0.416                              | 0.900         | 0.701         |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                         | 0.005                   | 0.005        | 0.005    | 0.005                              | 0.005         | 0.005         |
|                           | Total Kjeldahl Nitrogen            | mg/L    | -                                          | -                            | 0.02                    | 0.15         | 0.15     | 0.15                               | 0.18          | 0.23          |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                            | 1.9                     | 3.4          | 2.3      | 3.4                                | 3.8           | 3.1           |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                            | 2.2                     | 3.1          | 2.1      | 4.8                                | 4.9           | 3.4           |
|                           | Total Phosphorus                   | mg/L    | 0.030 <sup>α</sup>                         | -                            | 0.0045                  | 0.0065       | 0.0039   | 0.0058                             | 0.0267        | 0.0030        |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                            | 0.0010                  | 0.0010       | 0.0021   | 0.0018                             | 0.0010        | 0.0013        |
|                           | Bromide (Br)                       | mg/L    | -                                          | -                            | 0.1                     | 0.1          | 0.1      | 0.1                                | 0.1           | 0.1           |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                          | 1.2                     | 4.1          | 7.1      | 4.2                                | 8.0           | 8.4           |
|                           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                          | 1.3                     | 5.5          | 9.2      | 26.3                               | 52.1          | 32.3          |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                        | 0.078                   | <b>0.311</b> | 0.059    | 0.095                              | 0.011         | 0.011         |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                            | 0.0001                  | 0.0001       | 0.0001   | 0.0001                             | 0.0001        | 0.0001        |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                        | 0.00010                 | 0.0001275    | 0.0001   | 0.0001                             | 0.0001        | 0.0001        |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                            | 0.0036                  | 0.0095       | 0.0103   | 0.0107                             | 0.0151        | 0.0147        |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -                            | 0.0005                  | 0.0004       | 0.0005   | 0.0005                             | 0.0005        | 0.0005        |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                            | 0.0005                  | 0.0003875    | 0.0005   | 0.0005                             | 0.0005        | 0.0005        |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                            | 0.01                    | 0.010        | 0.010    | 0.013                              | 0.016         | 0.016         |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                      | 0.00001                 | 0.000009     | 0.000010 | 0.000026                           | 0.000025      | 0.000025      |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                            | 4.9                     | 11.8         | 16.5     | 17.5                               | 27.1          | 27.5          |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.00856                      | 0.00050                 | 0.00082      | 0.0005   | 0.0005                             | 0.0005        | 0.0005        |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                        | 0.00010                 | 0.0001575    | 0.0001   | 0.00011                            | 0.00011       | 0.0001        |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                       | 0.0007                  | 0.0011       | 0.0010   | <b>0.0029</b>                      | <b>0.0024</b> | <b>0.0023</b> |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                        | 0.077                   | 0.243        | 0.066    | 0.131                              | 0.089         | 0.061         |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                        | 0.00011                 | 0.00023      | 0.00009  | 0.00023                            | 0.00005       | 0.00005       |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                            | 0.0010                  | 0.0011       | 0.0010   | 0.0019                             | 0.0020        | 0.0019        |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                            | 2.86                    | 6.7          | 9.6      | 13.0                               | 20.7          | 20.4          |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                            | 0.00136                 | 0.00300      | 0.00102  | 0.00462                            | 0.00539       | 0.00293       |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                            | 0.000005                | 0.000005     | 0.000005 | 0.000005                           | 0.000005      | 0.000005      |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                            | 0.00015                 | 0.00045      | 0.00057  | 0.00351                            | 0.00390       | 0.00495       |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                        | 0.0005                  | 0.0007       | 0.0006   | 0.0015                             | 0.0013        | 0.0012        |
|                           | Potassium (K)                      | mg/L    | -                                          | -                            | 0.45                    | 0.93         | 1.04     | 2.44                               | 2.84          | 3.06          |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                            | 0.001                   | 0.0007625    | 0.001    | 0.001                              | 0.001         | 0.001         |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                            | 0.62                    | 1.25         | 0.87     | 1.39                               | 1.42          | 1.43          |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                       | 0.00001                 | 0.00002      | 0.00001  | 0.00001                            | 0.00001       | 0.00001       |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                            | 0.83                    | 2.76         | 3.97     | 2.46                               | 3.90          | 4.20          |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                            | 0.0049                  | 0.0139       | 0.0185   | 0.0142                             | 0.0200        | 0.0187        |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                       | 0.00010                 | 0.00008      | 0.00010  | 0.00010                            | 0.00010       | 0.00010       |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                            | 0.0001                  | 0.0001       | 0.0001   | 0.0001                             | 0.0001        | 0.0001        |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                            | 0.0108                  | 0.0241       | 0.0100   | 0.0100                             | 0.0100        | 0.0100        |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                            | 0.00045                 | 0.00405      | 0.00737  | 0.00371                            | 0.00789       | 0.01430       |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                        | 0.00100                 | 0.00115      | 0.00100  | 0.00100                            | 0.00100       | 0.00100       |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                        | 0.0030                  | 0.003        | 0.003    | 0.0063                             | 0.00565       | 0.00485       |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Canadian Water Quality Guideline except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]) and β (British Columbia Water Quality Guideline [BCWQG]). See Table 2.3 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data adopted from Camp Lake Tributaries.

were moderately (i.e., 5- to 10-fold) to highly (i.e.,  $\geq 10$ -fold) elevated at SDLT1 compared to the reference creeks in at least one of the spring, summer, or fall 2020 sampling events (Appendix Table C.35). Highest elevation in parameter concentrations typically occurred during the spring sampling event (Appendix Tables C.34 and C.35). In addition, higher parameter concentrations were generally observed at lower SDLT1 compared to upper SDLT1, suggesting that additional inputs of metals to SDLT1 occurred with distance downstream of the headwaters at the main mine camp (Appendix Table C.34).

Despite total copper concentrations above the AEMP benchmark and WQG at SDLT1 in 2020, the concentrations of copper during each seasonal sampling event were comparable to those reported at SDLT1 during baseline (Appendix Figure C.11; Appendix Table C.34), suggesting that copper concentrations were naturally high within this tributary prior to commencement of mine operations in 2015. Among the other parameters with established AEMP benchmarks, nitrate and sulphate concentrations were most consistently elevated at SDLT1 in 2020 (and other years of mine operation) compared to baseline (Appendix Figure C.11; Appendix Table C.33). For parameters without AEMP benchmarks, sodium and uranium were the only parameters with elevated concentrations for more than one of the three seasonal sampling events at SDLT1 in 2020 compared to baseline (Appendix Table C.33; Appendix Figure C.11). Overall, the key mine-related influences on water quality of SDLT1 based on comparisons to the reference creeks and baseline included elevated specific conductance and concentrations of molybdenum, nitrate, sulphate, and uranium, although none of the latter four parameters were observed at concentrations above applicable AEMP benchmarks and/or WQG.

#### 4.1.2 Sediment Quality

Sediment from SDLT1 was visually characterized as reddish-brown silt, whereas sediment from SDLT12 was mainly coarse sand and gravel, and sediment from SDLT9 was medium-sized coarse sand (Appendix Table D.18). Natural in-stream substrate at tributaries SDLT1 and SDLT12 is composed almost entirely of cobble and boulder material, but smaller particles tend to deposit interstitially in slow flowing areas and along the shoreline at both tributaries (Minnow 2018). In contrast, small cobble is the primary substrate type at SDLT9, but sand can constitute as much as 5 to 10% of the surficial bed material in this tributary (Minnow 2018). Sediment TOC content was low (i.e.,  $< 1\%$ ) in samples collected from SDLT1 and SDLT12, but slightly higher (0.8 to 4.0%) in samples from SDLT9 (Appendix Tables D.19, D.21, and D.22). Sediment TOC content was 6-fold higher (on average) at SDLT1 and SDLT12 than observed at lotic reference areas, but 17-fold higher at SDLT9 (Table 4.2; Appendix Table D.20). This suggested a more depositional environment and/or greater suspended sediment loads at the three Sheardown Lake tributaries compared to reference conditions.



**Table 4.2: Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributaries (SDLT1, 12, and 9) and Applicable Reference Creek and River Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter       | Units | SQG <sup>a</sup>     | Lotic Reference Stations                | Sheardown Lake Tributaries     |                                  |                                |
|-----------------|-------|----------------------|-----------------------------------------|--------------------------------|----------------------------------|--------------------------------|
|                 |       |                      | Unnamed Reference Creek (REFCRK; n = 3) | Sheardown Trib 1 SDLT1 (n = 3) | Sheardown Trib 12 SDLT12 (n = 3) | Sheardown Trib 9 SDLT9 (n = 3) |
|                 |       |                      | Average ± SD                            | Average ± SD                   | Average ± SD                     | Average ± SD                   |
| TOC             | %     | 10 <sup>α</sup>      | 0.12 ± 0.035                            | 0.76 ± 0.19                    | 0.75 ± 0.19                      | 2.03 ± 1.69                    |
| Aluminum (Al)   | mg/kg | -                    | 584 ± 185                               | 15,967 ± 1,601                 | 8,153 ± 807                      | 6,997 ± 3,386                  |
| Antimony (Sb)   | mg/kg | -                    | <0.10 ± 0                               | 0.17 ± 0.057                   | 0.22 ± 0.023                     | 0.11 ± 0.012                   |
| Arsenic (As)    | mg/kg | 17                   | 0.22 ± 0.11                             | 3.29 ± 1.13                    | 5.83 ± 1.00                      | 1.65 ± 1.15                    |
| Barium (Ba)     | mg/kg | -                    | 2.72 ± 0.722                            | 63.6 ± 13.2                    | 17.1 ± 6.11                      | 32.2 ± 19.4                    |
| Beryllium (Be)  | mg/kg | -                    | <0.10 ± 0                               | 0.65 ± 0.042                   | 0.68 ± 0.020                     | 0.32 ± 0.20                    |
| Bismuth (Bi)    | mg/kg | -                    | <0.20 ± 0                               | 0.48 ± 0.16                    | 0.25 ± 0.040                     | 0.22 ± 0.035                   |
| Boron (B)       | mg/kg | -                    | <5.0 ± 0                                | 6.8 ± 1.1                      | 5.5 ± 0.68                       | 8.50 ± 6.06                    |
| Cadmium (Cd)    | mg/kg | 3.5                  | <0.020 ± 0                              | 0.143 ± 0.0261                 | 0.051 ± 0.011                    | 0.064 ± 0.040                  |
| Calcium (Ca)    | mg/kg | -                    | 494 ± 249                               | 3,790 ± 1,060                  | 1,223 ± 643                      | 2,920 ± 1,974                  |
| Chromium (Cr)   | mg/kg | 90                   | 7.79 ± 5.39                             | 33.7 ± 2.25                    | 30.6 ± 0.643                     | 22.7 ± 10.3                    |
| Cobalt (Co)     | mg/kg | -                    | 0.953 ± 0.558                           | 13.3 ± 1.37                    | 14.6 ± 0.751                     | 6.24 ± 3.07                    |
| Copper (Cu)     | mg/kg | 110 <sup>α</sup>     | 1.21 ± 0.899                            | 24.0 ± 2.16                    | 19.4 ± 0.656                     | 15.7 ± 11.3                    |
| Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 12,493 ± 9,700                          | 152,667 ± 33,546               | 345,000 ± 53,731                 | 60,133 ± 40,945                |
| Lead (Pb)       | mg/kg | 91                   | 1.49 ± 0.546                            | 12.4 ± 0.666                   | 5.48 ± 1.05                      | 5.48 ± 3.02                    |
| Lithium (Li)    | mg/kg | -                    | <2.0 ± 0                                | 17.8 ± 1.20                    | 8.17 ± 1.69                      | 7.67 ± 3.50                    |
| Magnesium (Mg)  | mg/kg | -                    | 444 ± 165                               | 14,000 ± 2,166                 | 5,790 ± 957                      | 6,017 ± 3,033                  |
| Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 27.4 ± 14.6                             | 681 ± 51                       | 810 ± 103.9                      | 294 ± 175                      |
| Mercury (Hg)    | mg/kg | 0.486                | <0.0050 ± 0                             | 0.0065 ± 0.00067               | 0.0052 ± 0.00029                 | 0.0120 ± 0.0069                |
| Molybdenum (Mo) | mg/kg | -                    | <0.10 ± 0                               | 5.73 ± 1.33                    | 3.82 ± 0.248                     | 1.82 ± 1.27                    |
| Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 1.76 ± 0.920                            | 33.1 ± 1.14                    | 36.4 ± 1.70                      | 24.5 ± 14.8                    |
| Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 167 ± 98                                | 344 ± 50                       | 252 ± 51                         | 428 ± 155                      |
| Potassium (K)   | mg/kg | -                    | 133 ± 42                                | 5,817 ± 801                    | 800 ± 385                        | 1,597 ± 827                    |
| Selenium (Se)   | mg/kg | -                    | <0.20 ± 0                               | 0.21 ± 0.012                   | 0.27 ± 0.061                     | 0.27 ± 0.12                    |
| Silver (Ag)     | mg/kg | -                    | <0.10 ± 0                               | 0.12 ± 0.021                   | 0.10 ± 0                         | <0.10 ± 0                      |
| Sodium (Na)     | mg/kg | -                    | <50 ± 0                                 | 126 ± 29                       | <50 ± 0                          | 63 ± 22                        |
| Strontium (Sr)  | mg/kg | -                    | 2.00 ± 0.544                            | 3.9 ± 0.49                     | 2.1 ± 0.56                       | 4.06 ± 1.73                    |
| Sulphur (S)     | mg/kg | -                    | <1,000 ± 0                              | <1,000 ± 0                     | <1,000 ± 0                       | <1,000 ± 0                     |
| Thallium (Tl)   | mg/kg | -                    | <0.050 ± 0                              | 0.271 ± 0.0278                 | 0.068 ± 0.017                    | 0.153 ± 0.0785                 |
| Tin (Sn)        | mg/kg | -                    | <2.0 ± 0                                | <2.0 ± 0                       | <2.0 ± 0                         | <2.0 ± 0                       |
| Titanium (Ti)   | mg/kg | -                    | 83 ± 47                                 | 821 ± 134                      | 218 ± 69                         | 485 ± 139                      |
| Uranium (U)     | mg/kg | -                    | 0.479 ± 0.247                           | 4.35 ± 1.408                   | 2.33 ± 0.395                     | 1.28 ± 0.946                   |
| Vanadium (V)    | mg/kg | -                    | 16.8 ± 12.8                             | 27.7 ± 3.64                    | 15.6 ± 1.15                      | 18.0 ± 8.10                    |
| Zinc (Zn)       | mg/kg | 315                  | 3.0 ± 1.2                               | 75.8 ± 8.90                    | 25.2 ± 5.67                      | 23.1 ± 12.5                    |
| Zirconium (Zr)  | mg/kg | -                    | 2.1 ± 0.91                              | 9.0 ± 1.9                      | 3.5 ± 0.38                       | 2.9 ± 2.1                      |

 Indicates parameter concentration above SQG.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except  $\alpha$  = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and  $\beta$  = British Columbia Working SQG PEL (BC ENV 2020).

Mean concentrations of metals in sediment from both SDLT1 and SDLT12 were generally elevated compared to mean concentrations at lotic reference areas (Table 4.2; Appendix Table D.20). In particular, concentrations of aluminum, arsenic, barium, cobalt, copper, iron, magnesium, manganese, molybdenum, nickel, potassium, and zinc were highly elevated (i.e.,  $\geq 10$ -fold higher) in sediment from one or both of these tributaries compared to the lotic reference areas (Appendix Table D.20). In part, elevated metal concentrations in sediment from SDLT1 and SDLT12 may reflect finer substrate sizes and more depositional features of these tributaries compared to that observed at the lotic reference areas. On average, metal concentrations in sediment from SDLT1 and SDLT12 were below applicable SQG except for iron, which occurred at mean concentrations approximately four- and nine-times higher than the SQG, respectively, at these tributaries (Table 4.2; Appendix Tables D.19 and D.21). Sediment from SDLT9 had highly elevated concentrations of molybdenum relative to mean concentrations at the lotic reference areas, whereas mean concentrations of several other metals including aluminum, arsenic, barium, copper, iron, magnesium, manganese, nickel, and potassium were only moderately higher (i.e., 5-fold to 10-fold) at SDLT9 (Appendix Table D.20). Similar to the other Sheardown Lake tributaries, concentrations of all metals except iron (which was only 1.5 times greater than the SQG, on average) were well below SQG at SDLT9 (Table 4.2; Appendix Table D.22).

#### 4.1.3 Phytoplankton

Among the Sheardown Lake tributaries, phytoplankton (chlorophyll-a) monitoring is conducted only at SDLT1 as part of the Mary River Project CREMP (Table 2.1). Chlorophyll-a concentrations were lower at upper SDLT1 (Station D1 05) compared to near the creek mouth (Station D1 00) during each of the spring, summer, and fall sampling events in 2020 (Figure 4.2). Nitrate, phosphorus, and TKN concentrations were consistently the same or higher near the mouth of SDLT1 in 2020 (Appendix Table C.34), and thus higher chlorophyll-a concentrations near the mouth was in line with typical responses of phytoplankton to higher nutrient concentrations. Chlorophyll-a concentrations at SDLT1 were within the range of variability observed among reference creeks in spring and summer sampling events, but were considerably lower compared to the reference creeks in the summer sampling event (Figure 4.2). Although the latter may have reflected a mine-related influence on phytoplankton abundance occurring seasonally at lower SDLT1, chlorophyll-a concentrations were unusually high at the reference creeks in the summer of 2020 compared to previous years, and thus may not reflect the norm. For all sampling events in 2020, chlorophyll-a concentrations were well below the AEMP benchmark of 3.7  $\mu\text{g/L}$  at both of the SDLT1 monitoring stations (Figure 4.2). Similar to the reference creeks and Camp Lake tributaries, chlorophyll-a concentrations at SDLT1 were suggestive of oligotrophic, low productivity conditions based on Dodds et al (1998) trophic status





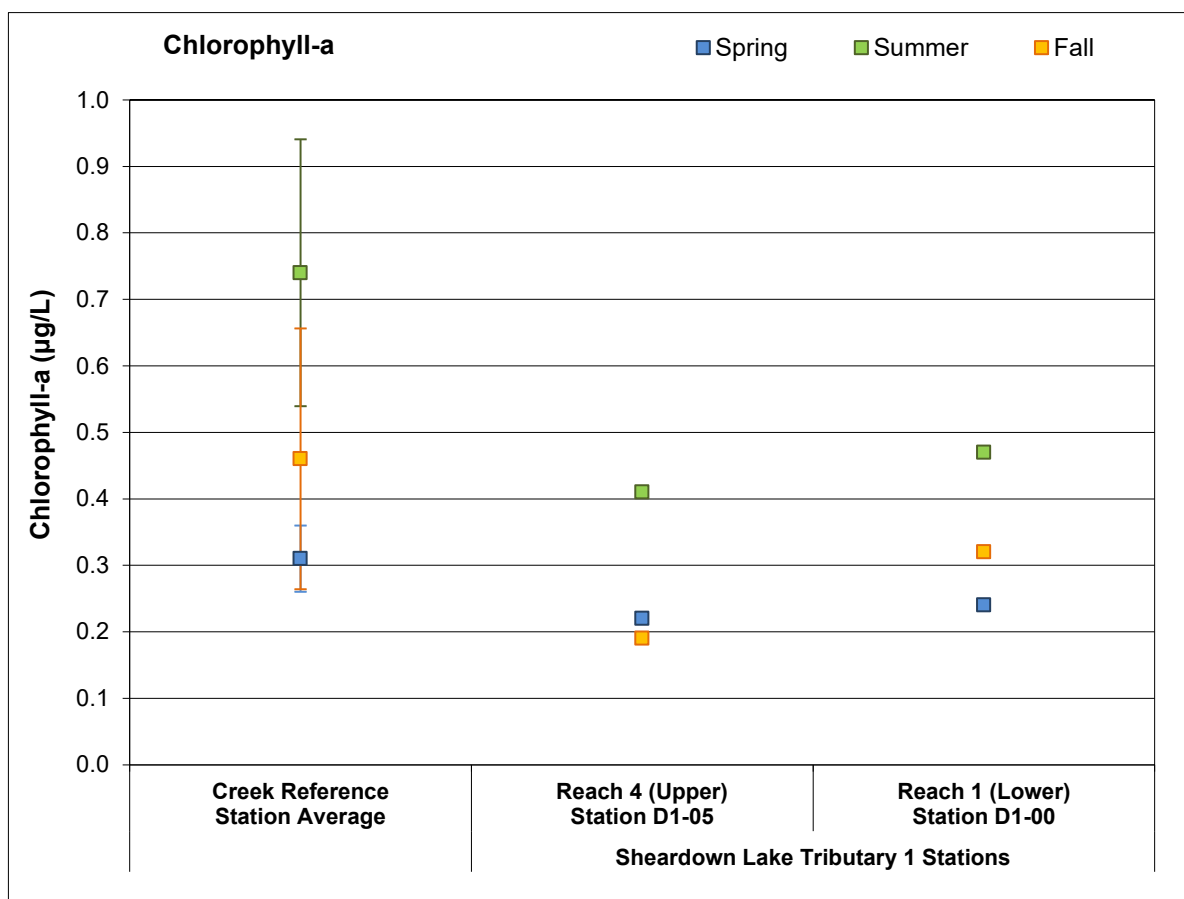


**Figure 4.2: Chlorophyll-a Concentrations at Sheardown Lake Tributary 1 Phytoplankton Monitoring Stations, Mary River Project CREMP, 2020**

Note: Reference creek data represented by average ( $\pm$  SD;  $n = 4$ ) calculated from CLT-REF and MRY-REF stations.

classification for stream environments (i.e., chlorophyll-a concentration  $<10 \mu\text{g/L}$ ). Relatively low chlorophyll-a concentrations at SDLT1 stations in 2020 were also consistent with an oligotrophic categorization using CWQG (CCME 2020) categorization based on aqueous phosphorus concentrations (i.e., concentrations below  $10 \mu\text{g/L}$ ; Table 4.1; Appendix Table C.33).

Chlorophyll-a concentrations at SDLT1 stations in fall 2020 were similar to those during the baseline period (Figure 4.3). In addition, no consistent directional changes in chlorophyll-a concentrations were shown at the SDLT1 stations during fall sampling events over the mine baseline (2005 to 2013), construction (2014), and operational (2015 to 2020) periods (Figure 4.3). These results suggested no adverse mine-related influences on phytoplankton productivity at SDLT1 over the past six years of mine operation.

#### **4.1.4 Benthic Invertebrate Community**

##### **4.1.4.1 Sheardown Lake Tributary 1 (SDLT1)**

The benthic invertebrate community at the lower reach of SDLT1, near the outlet to Sheardown Lake NW, showed significantly lower evenness and significant differences in composition (as indicated by Bray-Curtis Index) compared to Unnamed Reference Creek in 2020 (Table 4.3; Appendix Table F.29). Marked differences in community composition between SDLT1 and the reference creek included significantly higher relative abundance of Nemata and Chironomidae, and significantly lower relative abundance of Hydracarina, Ostracoda, and Simuliidae at SDLT1 (Table 4.3). However, an ecologically significant higher relative abundance of metal-sensitive Chironomidae occurred at SDLT1 compared to Unnamed Reference Creek (Table 4.3), suggesting that metals were not biologically available and/or were not a large contributor to community composition differences between SDLT1 and the reference creek. This result was consistent with concentrations of all metals below WQG at SDLT1, except copper which was slightly above the WQG, in 2020 (Table 4.1). Ecologically significant higher relative abundance of the shredder FFG was indicated at SDLT1 compared to Unnamed Reference Creek, suggesting a greater amount of in-stream vegetation and/or organic debris at SDLT1. In addition, ecologically significant higher relative abundance of the burrower HPG was shown at SDLT1 compared to the reference creek (Table 4.3), possibly indicating physical habitat alteration associated with sedimentation had affected benthic invertebrate community composition at SDLT1 relative to reference conditions.

No consistent ecologically significant differences in density, richness, or evenness were indicated at SDLT1 over years of mine operation (2015 to 2020) compared to baseline (Appendix Figure F.7; Appendix Table F.30). Similarly, no ecologically significant differences in the relative abundance of any dominant taxonomic groups were consistently indicated over years



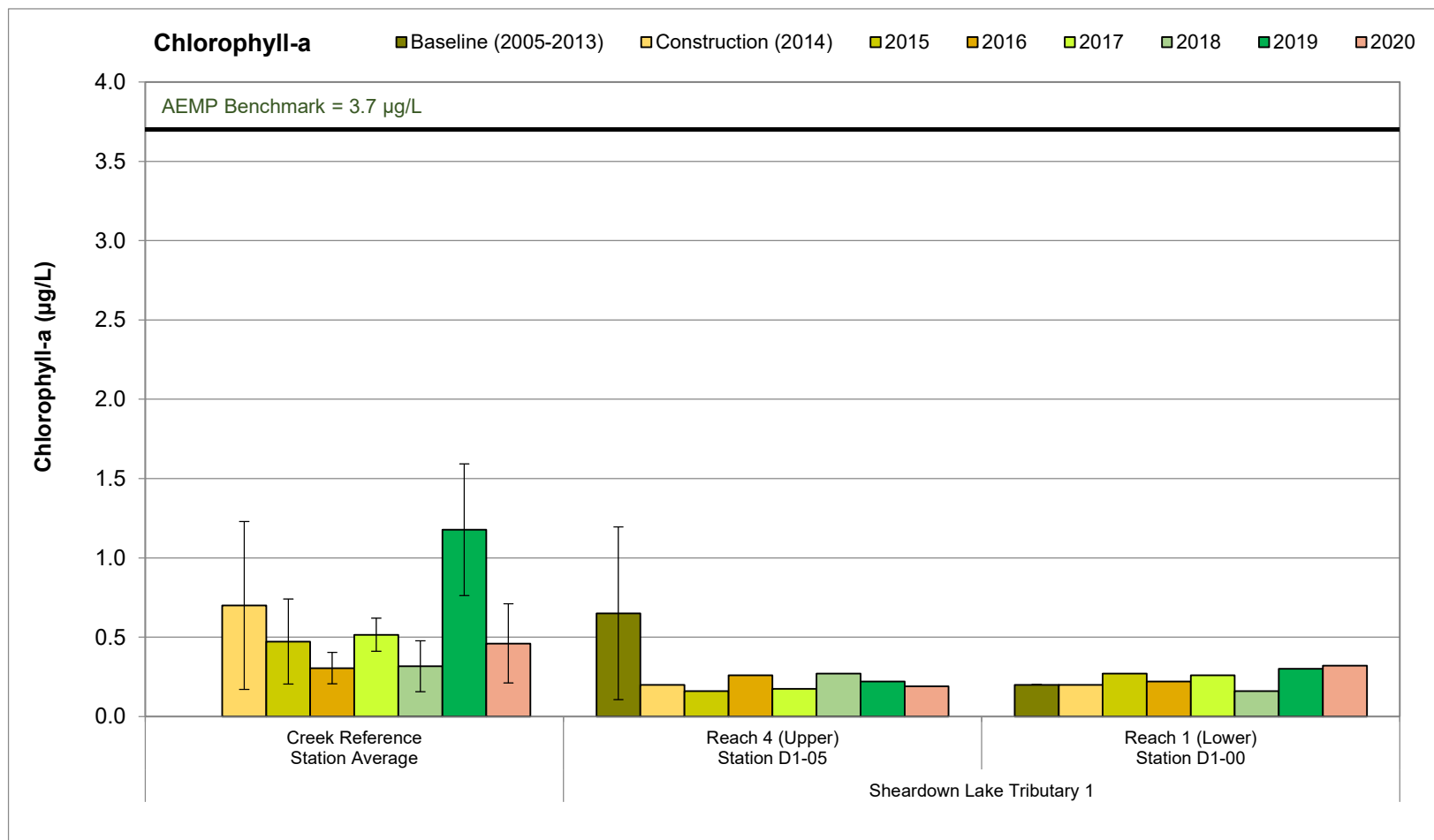


**Figure 4.3: Temporal Comparison of Chlorophyll-a Concentrations at Sheardown Lake Tributary 1 for Mine Baseline (2005 to 2013), Construction (2014), and Operational (2015 to 2020) Periods in the Fall, Mary River Project CREMP**

Note: Reference creek data represented by average ( $\pm$  SD;  $n = 4$ ) calculated from CLT-REF and MRY-REF stations.

**Table 4.3: Benthic Invertebrate Community Metric Statistical Comparison Results among the Sheardown Lake Tributaries and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                                       | Overall 4-Area Comparison     |                     |                                     |         | Pair-wise, <i>post hoc</i> comparisons |       |                         |                                  |                                 |
|----------------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------|-------|-------------------------|----------------------------------|---------------------------------|
|                                              | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Areas? | P-value | Study Area                             | Mean  | Standard Deviation (SD) | Magnitude of Difference (Ref SD) | Different from Reference Creek? |
| Density (No. per m <sup>2</sup> )            | ANOVA                         | log10               | YES                                 | 0.050   | Reference Creek                        | 713   | 296                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 679   | 625                     | -0.1                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 1,318 | 26                      | 2.0                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 1,601 | 841                     | 3.0                              | YES                             |
| Richness (No. of Taxa)                       | ANOVA                         | none                | NO                                  | 0.350   | Reference Creek                        | 16.0  | 4.4                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 13.4  | 2.9                     | -0.6                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 17.3  | 4.2                     | 0.3                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 18.0  | 4.7                     | 0.5                              | NO                              |
| Simpson's Evenness                           | ANOVA                         | none                | YES                                 | 0.019   | Reference Creek                        | 0.840 | 0.043                   | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 0.722 | 0.097                   | -2.7                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 0.832 | 0.063                   | -0.2                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 0.855 | 0.024                   | 0.3                              | NO                              |
| Nemata (% of community)                      | ANOVA                         | log10(x+1)          | YES                                 | 0.016   | Reference Creek                        | 0.7   | 1.3                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 6.2   | 3.6                     | 4.3                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 5.4   | 1.7                     | 3.7                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 3.1   | 2.3                     | 1.8                              | NO                              |
| Hydracarina (% of community)                 | K-W                           | rank                | YES                                 | 0.004   | Reference Creek                        | 4.5   | 3.7                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 1.1   | 0.9                     | -0.9                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 0.2   | 0.2                     | -1.2                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 4.2   | 1.8                     | -0.1                             | NO                              |
| Ostracoda (% of community)                   | K-W                           | rank                | YES                                 | 0.001   | Reference Creek                        | 30.6  | 11.7                    | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 0.0   | 0.1                     | -2.6                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 0.6   | 0.1                     | -2.6                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 8.2   | 2.6                     | -1.9                             | NO                              |
| Chironomidae (% of community)                | ANOVA                         | none                | YES                                 | <0.001  | Reference Creek                        | 48.3  | 12.9                    | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 85.0  | 6.9                     | 2.8                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 88.6  | 2.1                     | 3.1                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 70.3  | 4.3                     | 1.7                              | YES                             |
| Metal Sensitive Chironomids (% of community) | ANOVA                         | log10(x+1)          | YES                                 | 0.002   | Reference Creek                        | 0.8   | 1.2                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 10.5  | 5.3                     | 7.9                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 0.5   | 0.4                     | -0.3                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 3.2   | 3.6                     | 1.9                              | NO                              |
| Simuliidae (% of community)                  | ANOVA                         | log10(x+1)          | YES                                 | 0.020   | Reference Creek                        | 9.8   | 8.6                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 0.0   | 0.0                     | -1.1                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 0.0   | 0.0                     | -1.1                             | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 0.5   | 0.9                     | -1.1                             | YES                             |
| Tipulidae (% of community)                   | ANOVA                         | log10(x+1)          | NO                                  | 0.218   | Reference Creek                        | 1.5   | 2.3                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 3.9   | 2.5                     | 1.0                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 1.5   | 0.7                     | 0.0                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 3.1   | 1.3                     | 0.7                              | NO                              |
| Collector-Gatherer FFG (% of community)      | ANOVA                         | log10               | YES                                 | 0.002   | Reference Creek                        | 80.7  | 8.8                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 79.4  | 7.0                     | -0.1                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 82.2  | 1.4                     | 0.2                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 63.1  | 6.9                     | -2.0                             | YES                             |
| Shredder FFG (% of community)                | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | Reference Creek                        | 2.8   | 2.7                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 15.8  | 6.4                     | 4.9                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 16.9  | 1.8                     | 5.3                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 29.8  | 6.8                     | 10.2                             | YES                             |
| Clinger HPG (% of community)                 | ANOVA                         | log10               | YES                                 | 0.010   | Reference Creek                        | 15.8  | 7.7                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 15.1  | 5.7                     | -0.1                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 16.3  | 1.9                     | 0.1                              | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 33.4  | 8.1                     | 2.3                              | YES                             |
| Sprawler HPG (% of community)                | ANOVA                         | none                | YES                                 | <0.001  | Reference Creek                        | 79.4  | 6.6                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 72.1  | 6.0                     | -1.1                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT12                                 | 73.8  | 0.3                     | -0.8                             | NO                              |
|                                              |                               |                     |                                     |         | SDLT9                                  | 53.0  | 9.9                     | -4.0                             | YES                             |
| Burrower FFG (% of community)                | ANOVA                         | log10               | YES                                 | 0.032   | Reference Creek                        | 4.8   | 3.3                     | -                                | -                               |
|                                              |                               |                     |                                     |         | SDLT1                                  | 12.5  | 5.8                     | 2.3                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT12                                 | 9.9   | 1.6                     | 1.5                              | YES                             |
|                                              |                               |                     |                                     |         | SDLT9                                  | 8.1   | 2.8                     | 1.0                              | YES                             |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

 Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference between the mine-exposed area and reference area was ecologically meaningful.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

of mine operation compared to both years of baseline at SDLT1 (Appendix Table F.30).<sup>11</sup> However, consistent differences in FFG composition that included significantly higher relative abundance of collector-gatherers and significantly lower relative abundance of filterers and shredders at SDLT1 beginning in 2018 and 2019, respectively, compared to baseline potentially indicated a shift in the benthic invertebrate food base during more recent years of mine operation. Interestingly, the relative abundance of these FFG at SDLT1 since 2018 has more closely reflected the FFG composition at the reference creek, suggesting that the benthic invertebrate food base at SDLT1 more recently reflects the reference condition than was observed during baseline.

#### 4.1.4.2 Sheardown Lake Tributary 12 (SDLT12)

Benthic invertebrate density, richness, and evenness at SDLT12 did not differ significantly compared to Unnamed Reference Creek, but benthic invertebrate community compositional differences were indicated between SDLT12 and the reference creek in 2020 based on significantly differing Bray-Curtis Index (Table 4.3; Appendix Table F.29). Similar to SDLT1, the differences in community composition included significantly higher relative abundance of Nemata, Chironomidae, shredder FFG, and burrower HPG, and significantly lower relative abundance of Hydracarina, Ostracoda, and Simuliidae, at SDLT12 compared to Unnamed Reference Creek (Table 4.3). However, no significant differences in the relative abundance of metal-sensitive Chironomidae were indicated at SDLT12 compared to the reference creek in 2020 (Table 4.3). In addition, no ecologically significant differences in benthic invertebrate density, richness, evenness, and relative abundance of any dominant taxonomic groups or FFG were consistently indicated at SDLT12 over years of mine operation compared to baseline (Appendix Table F.32; Appendix Figure F.8). The dominant taxon at SDLT12 was the midge *Diplocladius*, which is characteristic of small, cool, slow-flowing or still streams (Armitage et al. 1995; Namayandeh et al 2016). Much lower densities of this midge were present at the reference creek (compare Appendix Tables F.4 and F.31), which suggested that the existence of significantly slower water velocity at SDLT12 compared to Unnamed Reference Creek (Appendix Table F.26) likely accounted for the differences in benthic invertebrate community composition shown between these creeks. Overall, no adverse influences of the mine on benthic invertebrate community structure or food resources were indicated at SDLT12 in 2020 and since the commencement of commercial mine operations in 2015.

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<sup>11</sup> Although the relative abundance of Tipulidae at SDLT1 was consistently significantly lower in years of mine operation compared to baseline data collected in 2008, no significant difference in the relative abundance of this group was indicated in years of mine operation relative to baseline data collected in 2013. In addition, the relative abundance of Tipulidae at SDLT1 from 2016 to 2020 was comparable to that shown at the reference creek in 2020, suggesting that the relative abundance of this group during baseline in 2008 was unusually high.



#### 4.1.4.3 Sheardown Lake Tributary 9 (SDLT9)

Benthic invertebrate density was significantly higher at SDLT9 compared to Unnamed Reference Creek, the magnitude of which was outside of the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$  (Table 4.3). In addition, richness, evenness, and relative abundance of all dominant groups, including metal-sensitive Chironomidae, did not differ significantly between SDLT9 and the reference creek at magnitudes considered ecologically meaningful (Table 4.3). Ecologically significant lower relative abundance of collector-gatherer FFG and sprawler HPG, and ecologically significant higher relative abundance of shredder FFG and clinger HPG, were indicated at SDLT9 compared to the reference creek in 2020 (Table 4.3). However, the relative abundance of all FFG, as well as benthic invertebrate density, richness, evenness, and relative abundance of all dominant taxonomic groups, showed no consistent differences over years of mine operation compared to baseline at SDLT9 (Appendix Table F.34; Appendix Figure F.9), indicating that the differences in FFG between SDLT9 and the reference creek in 2020 reflected natural phenomena. For instance, a higher relative abundance of the shredder FFG was consistent with field observations of greater amounts of rooted in-stream vegetation and organic debris, the primary food source for shredders, at SDLT9 compared to the reference creek (Appendix Table F.24). In turn, this suggested that differing amounts and/or types of organic material accounted for the differences in benthic invertebrate community composition between SDLT9 and the reference creek. Overall, no adverse influences of the mine on the benthic invertebrate community structure of SDLT12 were indicated since the commencement of commercial mine operations in 2015, including in 2020.

#### 4.1.5 Effects Assessment and Recommendations

At the SDLT1, the following AEMP benchmarks were exceeded in 2020:

- Aqueous total copper concentration greater than the benchmark of 0.0022 mg/L in spring, summer, and fall monitoring events (i.e., mean of 0.0029 mg/L, 0.0024 mg/L, and 0.0023 mg/L, respectively).

Although copper concentrations at SDLT1 were, on average, slightly higher than at the reference creeks in 2020, the concentration of copper in 2020 was closely comparable to those reported during baseline suggesting natural elevation. Given the proximity to mine operations and evidence of sedimentation, a mine-related source of copper to SDLT1 seems likely, but because no elevation in copper concentrations was indicated at SDLT1 from 2015 to 2020 compared to baseline conditions, copper concentrations at SDLT1 may just naturally be similar to the AEMP benchmark. Biological monitoring conducted at SDLT1 in 2020 indicated no adverse effects to phytoplankton or benthic invertebrates, potentially reflecting copper concentrations at, or just marginally above, the WQG. Because no adverse effects to biota were associated with





copper concentrations above the AEMP benchmark at SDLT1, a low action response to identify the likely source(s) of copper to the system is recommended to meet obligations under the AEMP Management Response Framework.

Benthic invertebrate community monitoring at SDLT12 and SDLT9 indicated no adverse influences of the mine on the benthic invertebrate community structure of either watercourse since the commencement of commercial mine operations in 2015, including in 2020. Under the AEMP Management Response Framework, no adjustment to the existing AEMP need be applied at SDLT12 and SDLT9 for the next monitoring program due to the absence of any mine-related changes shown in the benthic invertebrate community shown between the mine-operational period and baseline at these tributaries. However, because routine water quality monitoring is not conducted at either SDLT12 or SDLT9 under the current AEMP (Baffinland 2015), linkages between water chemistry and biological responses are not possible. Therefore, it is recommended that a water quality monitoring station be established at each of these watercourses and that the same AEMP water quality monitoring program implemented at SDLT1 be conducted at SDLT12 and SDLT9 in the future in order to provide water chemistry data to support the interpretation of biological data.

## **4.2 Sheardown Lake Northwest (DLO-1)**

### **4.2.1 Water Quality**

Water quality profiles of *in situ* water temperature, dissolved oxygen, pH, and specific conductance conducted at Sheardown Lake NW in 2020 showed no substantial station-to-station differences during any of the winter, summer, or fall sampling events (Appendix Figures C.12 to C.15). A warmer surface layer was indicated at Sheardown Lake NW during the summer sampling event in 2020 that extended to a depth of approximately 6 metres, but no complete thermal stratification developed in summer or during the winter or fall sampling events (Figure 4.4). Thermal changes with depth at Sheardown Lake NW were very similar to the patterns shown at Reference Lake 3 during the summer and fall sampling events in 2020 (Figure 4.4). The average water temperature at the bottom of the water column at Sheardown Lake NW littoral stations was significantly cooler than at Reference Lake 3 during the August 2020 biological study, but no differences in bottom water temperature were indicated between lakes at profundal sampling depths (Figure 4.5). Dissolved oxygen profiles at Sheardown Lake NW showed a distinct oxycline in winter and from depths of 4 to 11 metres in summer, but no oxycline was evident in fall indicating well mixed conditions (Figure 4.4). The general pattern in dissolved oxygen profiles at Sheardown Lake NW in summer and fall sampling events were similar to those observed at Reference Lake 3 in 2020 (Figure 4.4). Dissolved oxygen concentrations near the bottom of the water column were significantly lower at Sheardown Lake NW littoral and profundal



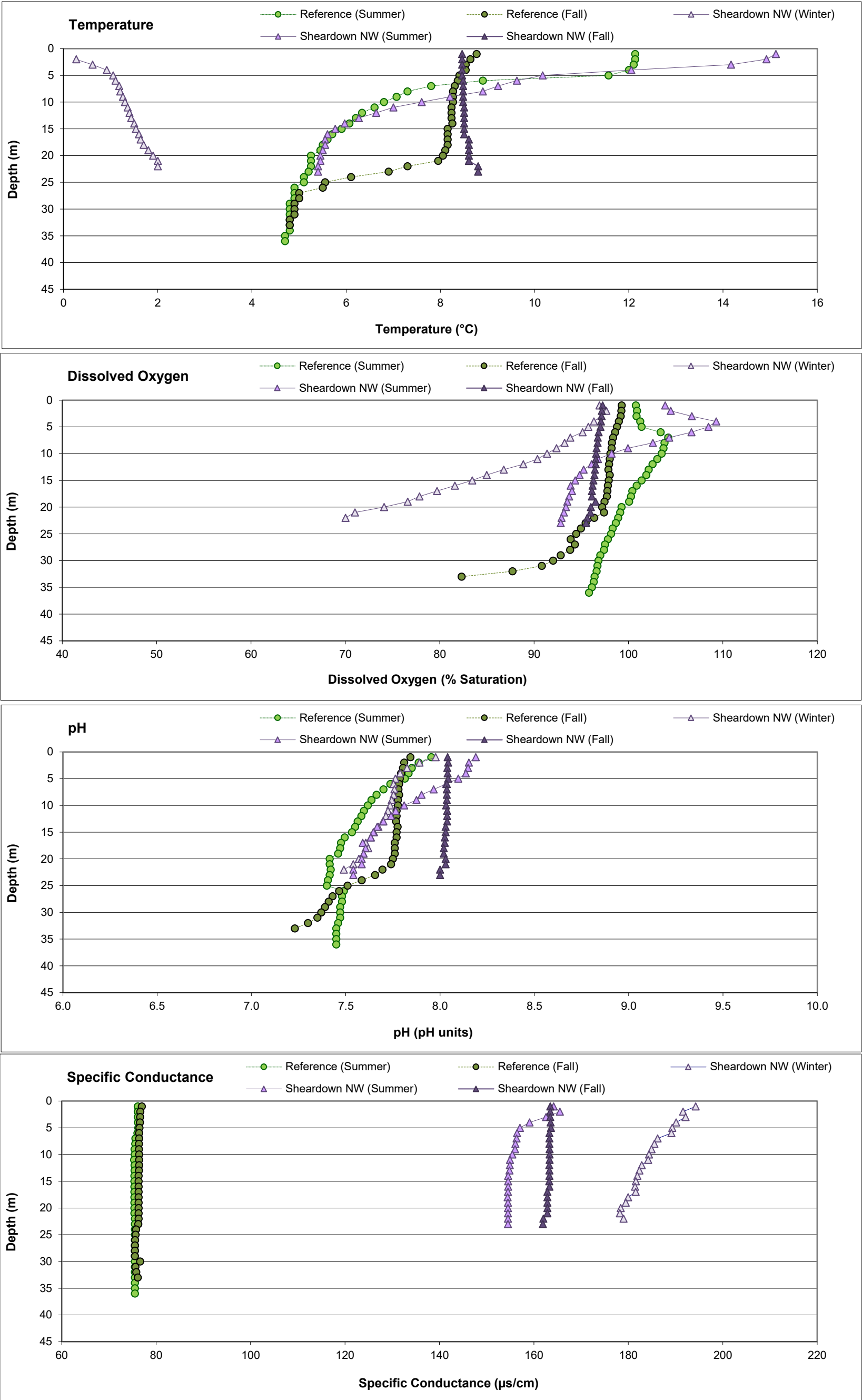


**Figure 4.4: Average *In Situ* Water Quality with Depth from Surface at Sheardown Lake NW (DLO-01) Compared to Reference Lake 3 during Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020**

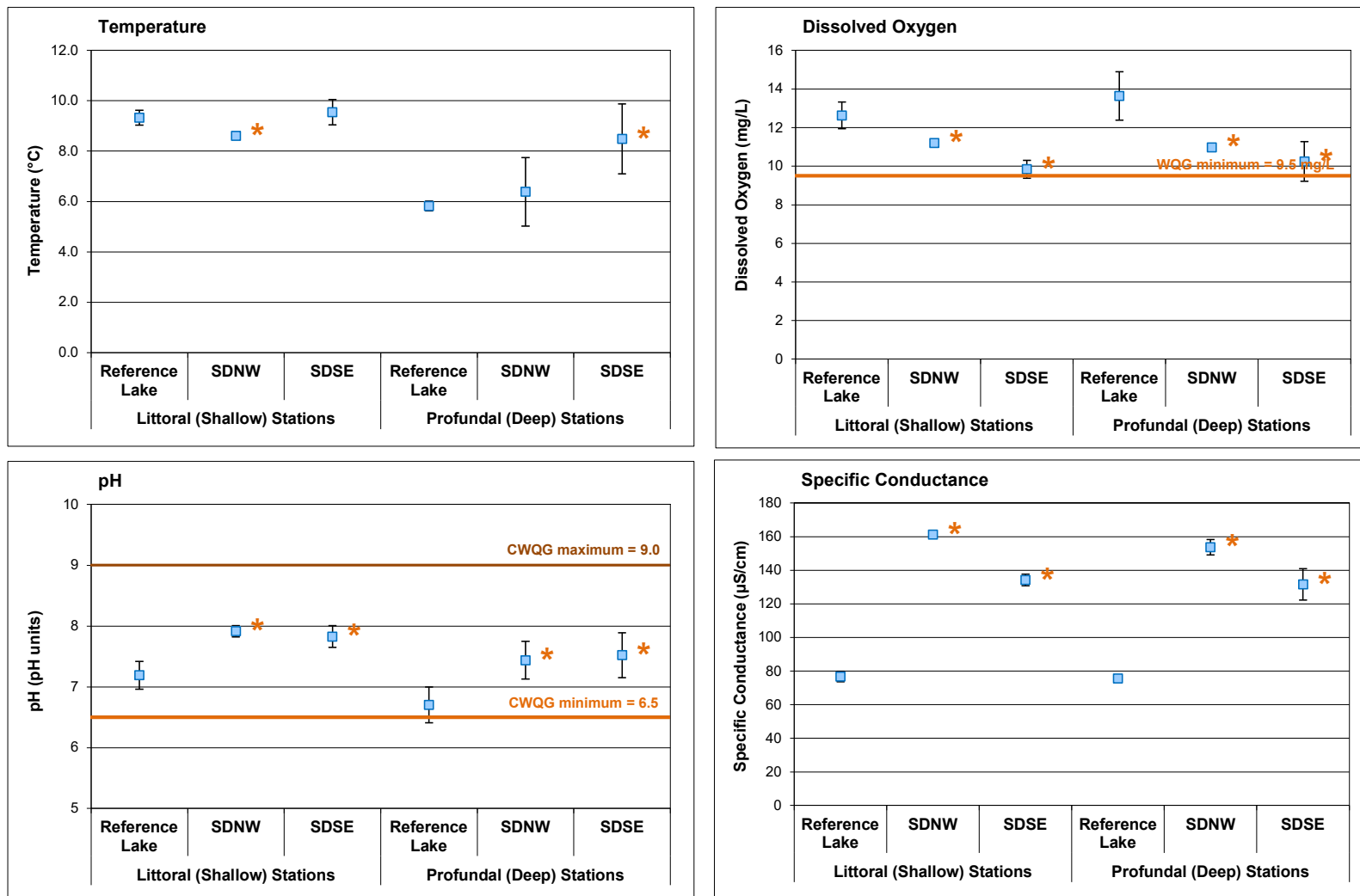


**Figure 4.5: Comparison of *In Situ* Water Quality Variables (mean  $\pm$  SD; n = 5) Measured at Sheardown Lake Basins (SDNW and SDSE) and Reference Lake 3 (REF3) Littoral and Profundal Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: An asterisk (\*) next to data point indicates mean value differs significantly from the Reference Lake 3 mean for the respective littoral or profundal station type.

stations than like habitat stations at Reference Lake 3 during the August 2020 biological study (Figure 4.5). However, mean dissolved oxygen concentrations were above the WQG of 9.5 mg/L near the bottom at littoral and profundal stations of Sheardown Lake NW during biological monitoring in August 2020 (Figure 4.5; Appendix Table C.40).

Water column profiles showed decreasing pH with increased depth at Sheardown Lake NW and Reference Lake 3 in 2020, with the changes in pH through the water column at both lakes appearing to coincide with changes in water temperature (Figure 4.4). The pH near the bottom at littoral and profundal stations of Sheardown Lake NW were significantly higher than at respective habitats at the reference lake during the August 2020 biological study (Figure 4.5). However, the mean incremental difference in bottom pH between lakes was less than a pH unit, and pH values were consistently within WQG limits at Sheardown Lake NW (Figure 4.5; Appendix Table C.40), suggesting that the pH difference between lakes was not ecologically meaningful. Specific conductance profiles at Sheardown Lake NW showed no distinct changes with depth during any of the winter, summer, or fall sampling events in 2020, and exhibited similar patterns to those observed at Reference Lake 3 (Figure 4.4). Specific conductance near the bottom of the water column was significantly higher at Sheardown Lake NW littoral and profundal stations compared to the reference lake (Figure 4.5; Appendix Table C.40). Water clarity, as determined through evaluation of Secchi depth, was significantly lower at Sheardown Lake NW than at the reference lake at the time of the August 2020 biological study (Appendix Figure C.8).

Water chemistry at Sheardown Lake NW met all AEMP benchmarks and WQG over the duration of spring, summer, and fall sampling events in 2020 (Table 4.4). Among those parameters with established AEMP benchmarks, aluminum, chloride, nitrate, and sulphate concentrations were elevated by factors greater than three at Sheardown Lake NW compared to the reference lake during the summer and fall sampling events (Table 4.4; Appendix Table C.43). Of those parameters without AEMP benchmarks, turbidity, total manganese concentrations, and total and dissolved molybdenum and uranium concentrations were elevated at Sheardown Lake NW compared to the reference lake during summer and/or fall sampling events in 2020 (Appendix Tables C.43 and C.45). Similar to previous studies, elevated total aluminum and manganese concentrations at Sheardown Lake NW compared to the reference lake in 2020 were associated with suspended material that contributed to elevated turbidity at Sheardown Lake NW (Table 4.4; Appendix Table C.42). Naturally high turbidity<sup>12</sup> at Sheardown Lake NW may reflect backflow received from Mary River that contains relatively high amounts of suspended aluminum--and manganese-bearing particulate minerals. Similar concentrations of dissolved

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<sup>12</sup> Turbidity at Sheardown Lake NW in 2020 was comparable to turbidity shown at the lake during baseline (Appendix Table C.44), suggesting that greater turbidity at this lake compared to Reference Lake 3 reflects a natural phenomenon.



Table 4.4: Mean Water Chemistry at Sheardown Lake NW (DLO-01) and Reference Lake 3 (REF3) Monitoring Stations<sup>a</sup> During Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>b</sup> | AEMP Benchmark <sup>c</sup> | Reference Lake 3 (n = 3) |          | Sheardown Lake NW Stations (n = 5) |          |          |
|---------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|--------------------------|----------|------------------------------------|----------|----------|
|                           |                                    |         |                                            |                             | Summer                   | Fall     | Winter                             | Summer   | Fall     |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                           | 79                       | 79       | 191                                | 164      | 166      |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.66                     | 7.75     | 7.65                               | 7.99     | 8.02     |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 35                       | 38       | 97                                 | 76       | 80       |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.0                      | 2.0      | 2.0                                | 2.5      | 2.0      |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 41                       | 51       | 118                                | 93       | 92       |
|                           | Turbidity                          | NTU     | -                                          | -                           | 0.15                     | 0.15     | 0.12                               | 0.84     | 0.55     |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 46                       | 34       | 76                                 | 59       | 74       |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.010                    | 0.014    | 0.025                              | 0.005    | 0.012    |
|                           | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                    | 0.020    | 0.211                              | 0.219    | 0.211    |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                    | 0.005    | 0.005                              | 0.001    | 0.005    |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.15                     | 0.16     | 0.17                               | 0.12     | 0.16     |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.3                      | 3.5      | 2.7                                | 1.8      | 2.0      |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.6                      | 3.8      | 3.8                                | 1.8      | 2.5      |
|                           | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.004                    | 0.003    | 0.007                              | 0.005    | 0.007    |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | 0.0010                   | 0.0011   | 0.002                              | 0.0018   | 0.002    |
|                           | Bromide (Br)                       | mg/L    | -                                          | -                           | 0.1                      | 0.1      | 0.1                                | 0.05     | 0.1      |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.4                      | 1.4      | 5.2                                | 4.2      | 4.5      |
|                           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 3.6                      | 3.6      | 17.1                               | 14.7     | 15.2     |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>d</sup>   | 0.0031                   | 0.003    | 0.005                              | 0.016    | 0.011    |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0064                   | 0.00696  | 0.00919                            | 0.00759  | 0.00819  |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | 0.0005                   | 0.0005   | 0.0005                             | 0.0001   | 0.0005   |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                   | 0.0005   | 0.0005                             | 0.00005  | 0.0005   |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                     | 0.01     | 0.0115                             | 0.01225  | 0.0135   |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | 0.00001                  | 0.00001  | 0.00001                            | 0.000005 | 0.00001  |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.2                      | 7.2      | 18.7                               | 14.1     | 15.5     |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.0005                   | 0.0005   | 0.0005                             | 0.0001   | 0.0005   |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00073                  | 0.0008   | 0.0010                             | 0.0009   | 0.0008   |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | 0.03                     | 0.03     | 0.03                               | 0.02     | 0.03     |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.00005                  | 0.00005  | 0.00005                            | 0.00005  | 0.00005  |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                   | 0.001    | 0.0015                             | 0.0014   | 0.0015   |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.2                      | 4.7      | 11.9                               | 9.2      | 10.1     |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.00080                  | 0.00068  | 0.00075                            | 0.00283  | 0.00132  |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.000005                 | 0.000005 | 0.000005                           | 0.000005 | 0.000005 |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00013                  | 0.00015  | 0.00120                            | 0.00097  | 0.00101  |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                  | 0.00050  | 0.00080                            | 0.00072  | 0.00069  |
|                           | Potassium (K)                      | mg/L    | -                                          | -                           | 0.9                      | 0.90     | 1.64                               | 1.33     | 1.38     |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.001                    | 0.001    | 0.001                              | 0.000052 | 0.001    |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.50                     | 0.50     | 0.62                               | 0.63     | 0.56     |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.00001                  | 0.00001  | 0.00001                            | 0.00001  | 0.00001  |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.9                      | 0.96     | 2.25                               | 1.83     | 1.96     |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0084                   | 0.0082   | 0.0132                             | 0.0104   | 0.0108   |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.0001                   | 0.0001   | 0.0001                             | 0.00001  | 0.0001   |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.010                    | 0.010    | 0.010                              | 0.001    | 0.010    |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00032                  | 0.00033  | 0.00143                            | 0.00135  | 0.00153  |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | 0.0010                   | 0.001    | 0.001                              | 0.0005   | 0.001    |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                   | 0.003    | 0.003                              | 0.003    | 0.003    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Values presented are averages from samples taken from the surface and the bottom of the water column at each lake for the indicated season.

<sup>b</sup> Canadian Water Quality Guideline (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>c</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake NW.

<sup>d</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively (Intrinsik 2013).

aluminum and manganese between Sheardown Lake NW and Reference Lake 3 in 2020 (and historically) suggested that the mine was unlikely to be the source of these metals (Appendix Tables C.43 and C.45). Sulphate was the only parameter among those with established AEMP benchmarks that was elevated in 2020 compared to baseline at Sheardown Lake NW (Appendix Figure C.16), as were dissolved molybdenum and uranium concentrations among those parameters without AEMP benchmarks (Appendix Tables C.42 and C.44). Overall, a slight mine-related influence on water quality of Sheardown Lake NW was indicated in 2020 as reflected by elevated concentrations of chloride, molybdenum, nitrate, sulphate, and uranium. However, concentrations of all parameters remained well below AEMP benchmarks and WQG since commercial mine operations commenced in 2015, and therefore no adverse biological effects were expected at Sheardown Lake NW.

#### 4.2.2 Sediment Quality

Surficial sediment in Sheardown Lake NW was primarily composed of silt, except at littoral station DLO-01-10, which contained 93% sand (Figure 4.6; Appendix Table D.25). Except for a slightly higher percentage of clay in sediments from profundal stations in Sheardown Lake NW, no differences in sediment particle size were noted relative to stations sharing like-habitat at Reference Lake 3 (Appendix Table D.26). The TOC content in sediment from littoral and profundal stations at Sheardown Lake NW was significantly lower, and sediment was significantly more compact (i.e., lower moisture content), than at the reference lake (Appendix Table D.26). Similar to observations at Reference Lake 3 and Camp Lake, reddish-brown oxidized material was observed on the surface of Sheardown Lake NW sediments at sine stations (Appendix Tables D.23 and D.24). This material occasionally occurred as a thin, distinct layer that was likely principally composed of iron (oxy)hydroxide precipitate. Substrate of Sheardown Lake NW exhibited some blackening (or unusually dark colouration), and traces of a sulphidic odour at some stations at the time of the August 2020 sampling event (Appendix Tables D.23 and D.24), suggesting the occurrence of reducing conditions in the sediment similar to that observed at the reference lake (Appendix Tables D.3 and D.4).

No consistent spatial differences in sediment metal concentrations occurred between Sheardown Lake NW stations located nearest to key tributary inlets (e.g., SDLT1 and SDLT12) and those located near the lake outlet in 2020 (Appendix Table D.25). Although arsenic, cadmium, iron, nickel, and uranium concentrations were highest in sediment at the Sheardown Lake NW station located closest to the outlet of SDLT1 (i.e., Station DD-HAB 9-STN2), higher concentrations of these metals may be related to high TOC content at this location (Appendix Table D.25). Sheardown Lake Tributary 1 was previously identified as a source of iron loadings to the lake (Section 4.1.2), so elevated iron concentrations at this location are not unexpected. Mean metal





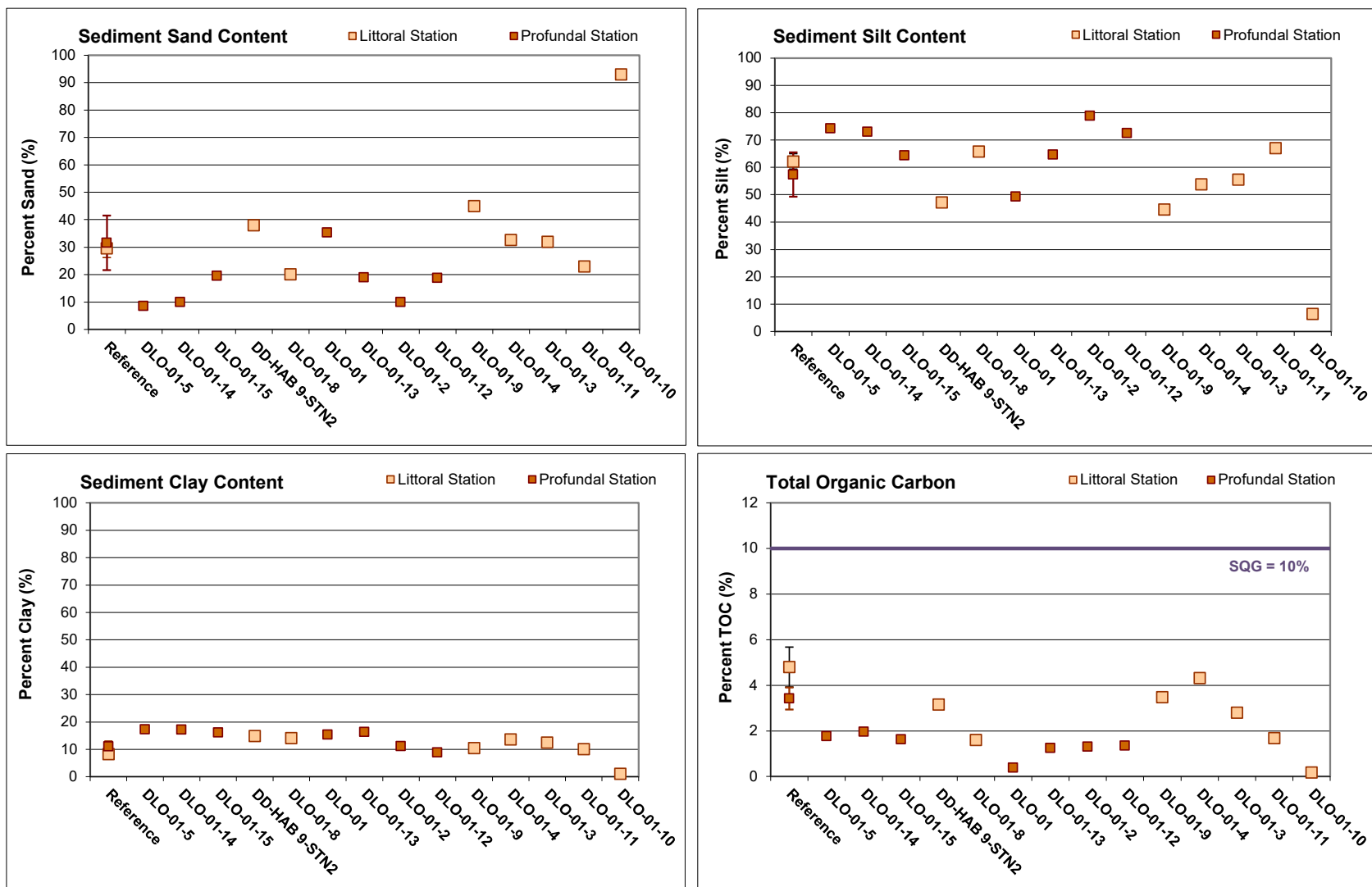


**Figure 4.6: Sediment Particle Size and Total Organic Carbon (TOC) Content Comparisons among Sheardown Lake NW (DLO-01) Sediment Monitoring Stations and Reference Lake 3 (mean  $\pm$  SE), Mary River Project CREMP, August 2020**

concentrations in littoral and profundal sediment of Sheardown Lake NW were very similar to mean concentrations observed at like-habitat in Reference Lake 3, the only exception being slightly elevated (i.e., 3- to 5-fold higher) mean concentration of manganese at the Sheardown Lake NW profundal stations (Table 4.5; Appendix Table D.27). Although average concentrations of iron were above SQG in sediment from littoral stations in Sheardown Lake NW, the average concentration of iron was also above the SQG in sediment from Reference Lake 3 indicating naturally elevated concentrations of iron (Table 4.5). Nickel was also above the SQG in sediment from one littoral station in Sheardown Lake NW (Appendix Table D.25). In addition to iron, manganese was above the SQG in profundal sediments from Sheardown Lake NW and the reference lake, indicating manganese is also naturally elevated in the study area (Table 4.5). Only the mean concentration of manganese in profundal sediment of Sheardown Lake NW was above the lake-specific AEMP benchmark, whereas at the reference lake, mean concentrations of copper, iron, and manganese were elevated above the Sheardown Lake NW AEMP benchmarks in littoral and profundal sediments (Table 4.5).

Metal concentrations in sediment from Sheardown Lake NW in 2020 were comparable to those observed during the mine baseline (2005 to 2013) period (Figure 4.7; Appendix Table D.27).<sup>13</sup> On average, metal concentrations in sediment of Sheardown Lake NW in 2020 were within the range of those observed from 2015 to 2019, except for manganese at the profundal stations where concentrations were higher than historically (although the variability in concentrations among sampling stations was substantial, as indicated by the high standard deviation; Figure 4.7). No continual increase in mean concentrations of any metals were apparent from 2015 to 2020 at the Sheardown Lake NW littoral or profundal stations, including for manganese (Figure 4.7). Overall, no substantial changes in sediment metal concentrations of Sheardown Lake NW have occurred since the commencement of mine operations in 2015.

#### 4.2.3 Phytoplankton

Chlorophyll-a concentrations at Sheardown Lake NW showed no consistent spatial gradients with progression towards the lake outlet among the winter, summer, and fall sampling events in 2020 (Figure 4.8). Chlorophyll-a concentrations differed significantly among seasons at Sheardown Lake NW, with highest and lowest concentrations observed in summer and winter, respectively (Appendix Tables E.5 and E.6) reflecting similar occurrence of highest chlorophyll-a concentrations in the summer sampling event at the reference lake (Appendix Table B.7).

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<sup>13</sup> See footnote 6 regarding differences in the concentration of boron in sediment between baseline and recent CREMP studies.



**Table 4.5: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Sheardown Lake NW (DLO-01) and Reference Lake 3 (REF3) Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter |                 | Units | SQG <sup>a</sup>     | AEMP Benchmark <sup>b</sup><br>(NW, SE) | Littoral                  |                              | Profundal                 |                              |
|-----------|-----------------|-------|----------------------|-----------------------------------------|---------------------------|------------------------------|---------------------------|------------------------------|
|           |                 |       |                      |                                         | Reference Lake<br>(n = 5) | Sheardown Lake NW<br>(n = 4) | Reference Lake<br>(n = 5) | Sheardown Lake NW<br>(n = 4) |
|           |                 |       |                      |                                         | Average ± SD              | Average ± SD                 | Average ± SD              | Average ± SD                 |
| TOC       |                 | %     | 10 <sup>a</sup>      | -                                       | 4.80 ± 1.96               | 2.10 ± 1.39                  | 3.42 ± 1.08               | 1.17 ± 0.576                 |
| Metals    | Aluminum (Al)   | mg/kg | -                    | -                                       | 16,880 ± 1,785            | 15,635 ± 8,686               | 21,800 ± 2,185            | 20,675 ± 3,970               |
|           | Antimony (Sb)   | mg/kg | -                    | -                                       | <0.10 ± 0                 | <0.10 ± 0                    | <0.10 ± 0                 | <0.10 ± 0                    |
|           | Arsenic (As)    | mg/kg | 17                   | 6.2, 5.9                                | 3.53 ± 1.09               | 4.05 ± 2.84                  | 4.07 ± 0.397              | 3.72 ± 0.66                  |
|           | Barium (Ba)     | mg/kg | -                    | -                                       | 117 ± 22.0                | 87 ± 58                      | 122 ± 18.3                | 110 ± 41                     |
|           | Beryllium (Be)  | mg/kg | -                    | -                                       | 0.65 ± 0.073              | 0.88 ± 0.48                  | 0.80 ± 0.092              | 0.98 ± 0.176                 |
|           | Bismuth (Bi)    | mg/kg | -                    | -                                       | <0.20 ± 0                 | 0.23 ± 0.024                 | <0.20 ± 0                 | 0.24 ± 0.04                  |
|           | Boron (B)       | mg/kg | -                    | -                                       | 12.2 ± 0.853              | 25.8 ± 14.1                  | 14.7 ± 1.77               | 29.9 ± 5.78                  |
|           | Cadmium (Cd)    | mg/kg | 3.5                  | 1.5, 1.5                                | 0.173 ± 0.047             | 0.252 ± 0.177                | 0.148 ± 0.0172            | 0.253 ± 0.046                |
|           | Calcium (Ca)    | mg/kg | -                    | -                                       | 5,608 ± 1,247             | 4,023 ± 1,857                | 5,010 ± 407               | 4,270 ± 593                  |
|           | Chromium (Cr)   | mg/kg | 90                   | 97, 79                                  | 54.3 ± 4.40               | 60.1 ± 30.9                  | 65.0 ± 6.64               | 71.3 ± 11.41                 |
|           | Cobalt (Co)     | mg/kg | -                    | -                                       | 10.8 ± 1.64               | 11.5 ± 6.39                  | 15.2 ± 1.56               | 15.9 ± 3.32                  |
|           | Copper (Cu)     | mg/kg | 110                  | 58, 56                                  | 71.4 ± 14.2               | 38.0 ± 21.8                  | <b>83.8</b> ± 11.1        | 42.5 ± 6.55                  |
|           | Iron (Fe)       | mg/kg | 40,000 <sup>a</sup>  | 52,200, 34,400                          | <b>50,600</b> ± 24,939    | <b>41,200</b> ± 21,466       | <b>45,080</b> ± 4,440     | <b>43,350</b> ± 12,934       |
|           | Lead (Pb)       | mg/kg | 91.3                 | 35                                      | 13.8 ± 0.799              | 16.5 ± 8.55                  | 16.7 ± 1.82               | 19.7 ± 3.94                  |
|           | Lithium (Li)    | mg/kg | -                    | -                                       | 26.0 ± 2.51               | 29.6 ± 16.3                  | 33.7 ± 3.83               | 33.2 ± 6.59                  |
|           | Magnesium (Mg)  | mg/kg | -                    | -                                       | 11,440 ± 814              | 9,930 ± 5,277                | 14,180 ± 1,422            | 13,105 ± 2,514               |
|           | Manganese (Mn)  | mg/kg | 1,100 <sup>a,β</sup> | 4,530, 657                              | 579 ± 258                 | 526 ± 380                    | <b>1,230</b> ± 355        | <b>5,291</b> ± 5,948         |
|           | Mercury (Hg)    | mg/kg | 0.486                | 0.17                                    | 0.0500 ± 0.0178           | 0.0306 ± 0.0198              | 0.0583 ± 0.0164           | 0.0332 ± 0.01397             |
|           | Molybdenum (Mo) | mg/kg | -                    | -                                       | 4.44 ± 3.31               | 3.08 ± 1.93                  | 2.52 ± 0.273              | 5.22 ± 4.69                  |
|           | Nickel (Ni)     | mg/kg | 75 <sup>a,β</sup>    | 77, 66                                  | 40.0 ± 3.52               | 56.1 ± 31.1                  | 45.0 ± 4.54               | 61.4 ± 9.82                  |
|           | Phosphorus (P)  | mg/kg | 2,000 <sup>a</sup>   | 1,958, 1,278                            | 1,167 ± 394               | 832 ± 379                    | 956 ± 47.3                | 900 ± 94.6                   |
|           | Potassium (K)   | mg/kg | -                    | -                                       | 4,100 ± 453               | 4,168 ± 2,333                | 5,338 ± 543               | 5,288 ± 1,043                |
|           | Selenium (Se)   | mg/kg | -                    | -                                       | 0.73 ± 0.31               | 0.37 ± 0.15                  | 0.61 ± 0.18               | 0.32 ± 0.11                  |
|           | Silver (Ag)     | mg/kg | -                    | -                                       | 0.14 ± 0.047              | 0.16 ± 0.042                 | 0.20 ± 0.057              | 0.16 ± 0.024                 |
|           | Sodium (Na)     | mg/kg | -                    | -                                       | 304.2 ± 32                | 232 ± 122                    | 369 ± 50                  | 283 ± 50                     |
|           | Strontium (Sr)  | mg/kg | -                    | -                                       | 11.6 ± 1.70               | 9.45 ± 3.72                  | 12.3 ± 1.24               | 11.40 ± 1.50                 |
|           | Sulphur (S)     | mg/kg | -                    | -                                       | 1,400 ± 387               | <1,000 ± 0                   | 1,140 ± 195               | <1,000 ± 0                   |
|           | Thallium (Tl)   | mg/kg | -                    | -                                       | 0.379 ± 0.0415            | 0.419 ± 0.242                | 0.594 ± 0.094             | 0.514 ± 0.1225               |
|           | Tin (Sn)        | mg/kg | -                    | -                                       | <2.0 ± 0                  | <2.0 ± 0                     | <2.0 ± 0                  | <2.0 ± 0                     |
|           | Titanium (Ti)   | mg/kg | -                    | -                                       | 1,006 ± 109               | 934 ± 472                    | 1,136 ± 50                | 1,194 ± 210.5                |
|           | Uranium (U)     | mg/kg | -                    | -                                       | 11.0 ± 2.41               | 6.17 ± 3.68                  | 19.7 ± 3.76               | 6.37 ± 1.212                 |
|           | Vanadium (V)    | mg/kg | -                    | -                                       | 54.1 ± 5.40               | 45.8 ± 23.4                  | 63.4 ± 4.89               | 56.7 ± 9.97                  |
|           | Zinc (Zn)       | mg/kg | 315                  | 135                                     | 73.1 ± 7.83               | 53.5 ± 29.0                  | 83.8 ± 8.52               | 63.3 ± 11.80                 |
|           | Zirconium (Zr)  | mg/kg | -                    | -                                       | 4.5 ± 1.0                 | 10.1 ± 6.4                   | 3.9 ± 0.32                | 7.03 ± 1.68                  |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD**Indicates parameter concentration above the AEMP Benchmark.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020)

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to the Sheardown Lake basins

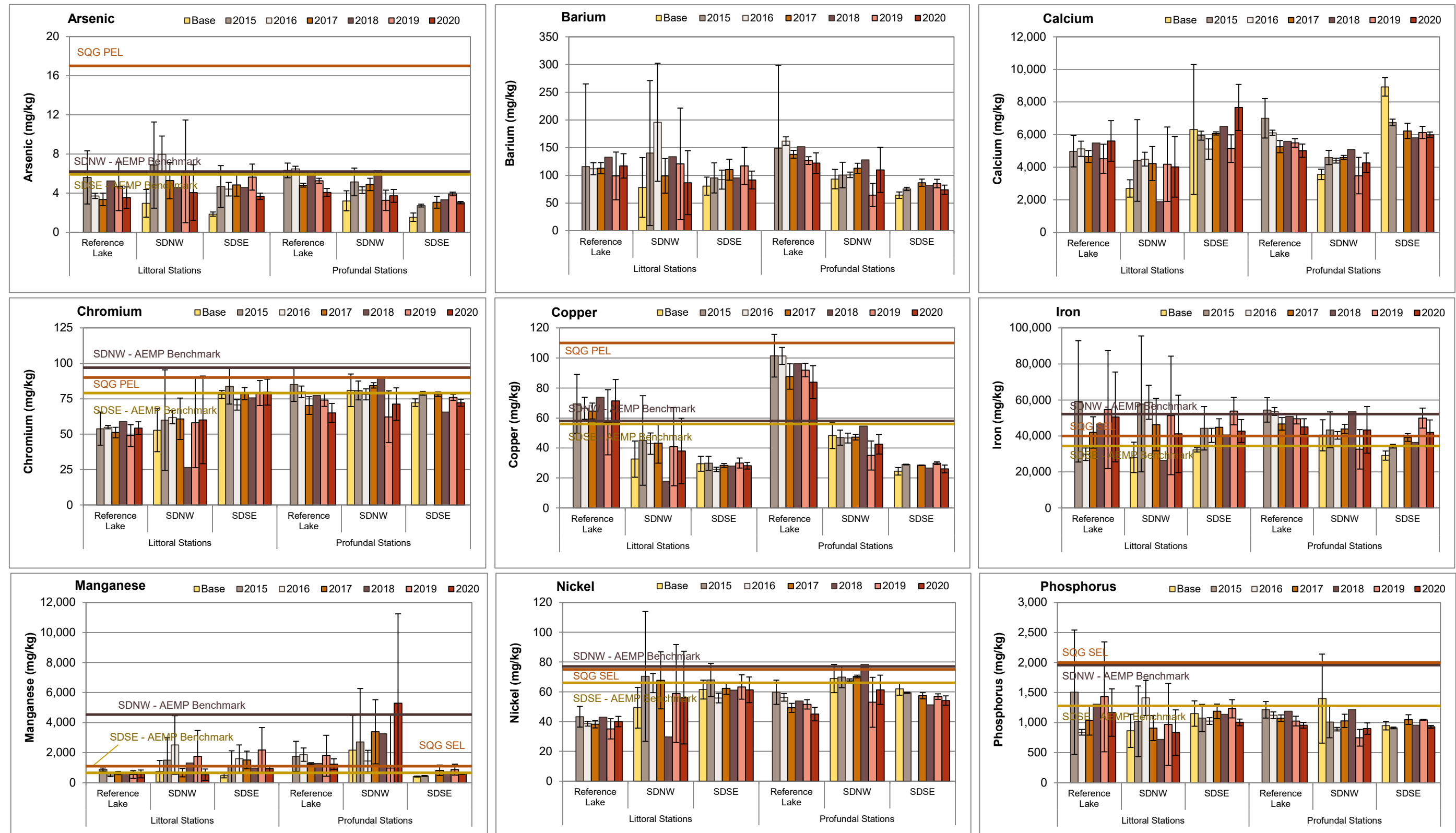


**Figure 4.7: Temporal Comparison of Sediment Metal Concentrations (mean  $\pm$  SD) at Littoral and Profundal Stations of Sheardown Lake NW (SDNW), Sheardown Lake SE (SDSE), and Reference Lake 3 for Mine Baseline (2005 to 2013) and Operational (2015 to 2020) Periods**

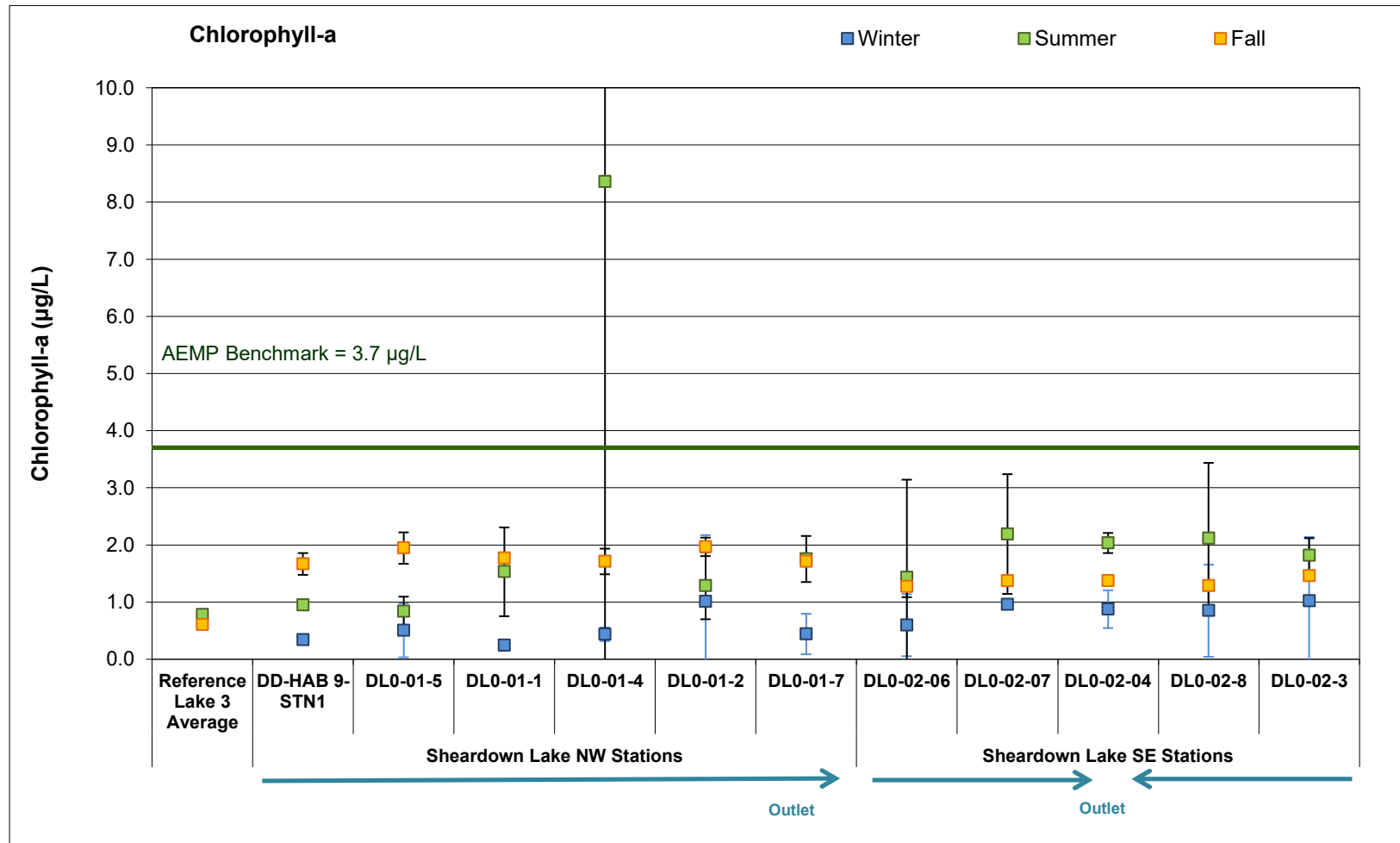


**Figure 4.8: Chlorophyll-a Concentrations at Sheardown Lake NW (DLO-1) and Sheardown Lake SE (DLO-2) Phytoplankton Monitoring Stations, Mary River Project CREMP, 2020**

Notes: Values are averages of samples taken from the surface and the bottom of the water column at each station. Reference values are expressed as mean  $\pm$  standard deviation ( $n = 3$ ). Reference Lake 3 was not sampled in winter 2020.

Although chlorophyll-a concentrations were significantly higher at Sheardown Lake NW compared to Reference Lake 3 for both the summer and fall sampling events in 2020 (Appendix Tables E.7 and E.8), chlorophyll-a concentrations during each of the winter, summer, and fall sampling events at Sheardown Lake NW were well below the AEMP benchmark of 3.7 µg/L for all samples except one sample in July (Figure 4.8). For the sample that exceeded the benchmark, the chlorophyll-a concentration (15 µg/L) was an order of magnitude higher than any other sample collected in the lake on the same day, suggesting a sampling or laboratory analysis issue rather than an actual increase in phytoplankton abundance. Chlorophyll-a concentrations at Sheardown Lake NW were suggestive of an 'oligotrophic' status using Wetzel (2001) lake trophic status classifications. This trophic status classification was consistent with an oligotrophic categorization for Sheardown Lake NW using CWQG (CCME 2020) classifications based on aqueous total phosphorus concentrations near the surface (i.e., concentrations below 10 µg/L; Table 4.4; Appendix Table C.42).

Chlorophyll-a concentrations at Sheardown Lake NW in 2020 were within the ranges shown among years of mine construction (2014) and previous mine operation (2015 to 2019), and showed no consistent direction of changes for any of the winter, summer, or fall seasons (Figure 4.9; Appendix Table E.11). This suggested no ecologically meaningful changes in the trophic status of Sheardown Lake NW since the onset of mine operations in 2015. No chlorophyll-a data are available for Sheardown Lake NW over the mine baseline period (2005 to 2013), precluding comparisons of Sheardown Lake NW chlorophyll-a data to the period prior to mine construction.

#### 4.2.4 Benthic Invertebrate Community

Benthic invertebrate density was significantly higher at littoral and profundal habitats of Sheardown Lake NW compared to like-habitat at Reference Lake 3 at magnitudes outside of the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$  (Tables 4.6 and 4.7). Although no significant differences in richness or evenness were indicated between Sheardown Lake NW and the reference lake for either littoral or profundal habitat (Tables 4.6 and 4.7), Bray-Curtis Index differed significantly between Sheardown Lake NW and Reference Lake 3 for both habitat types (Appendix Table F.21). Because no ecologically significant differences (i.e.,  $CES_{BIC}$  outside of  $\pm 2 SD_{REF}$ ) in the relative abundance of any dominant taxonomic groups were indicated between Sheardown Lake NW and the reference lake for either habitat type (Tables 4.6 and 4.7), the difference in Bray-Curtis Index between lakes likely reflected substantially higher benthic invertebrate density at Sheardown Lake NW. The occurrence of higher benthic invertebrate density without an accompanying difference in evenness or dominant taxonomic groups suggested that Sheardown Lake NW was simply more productive than Reference Lake 3. This was supported by the





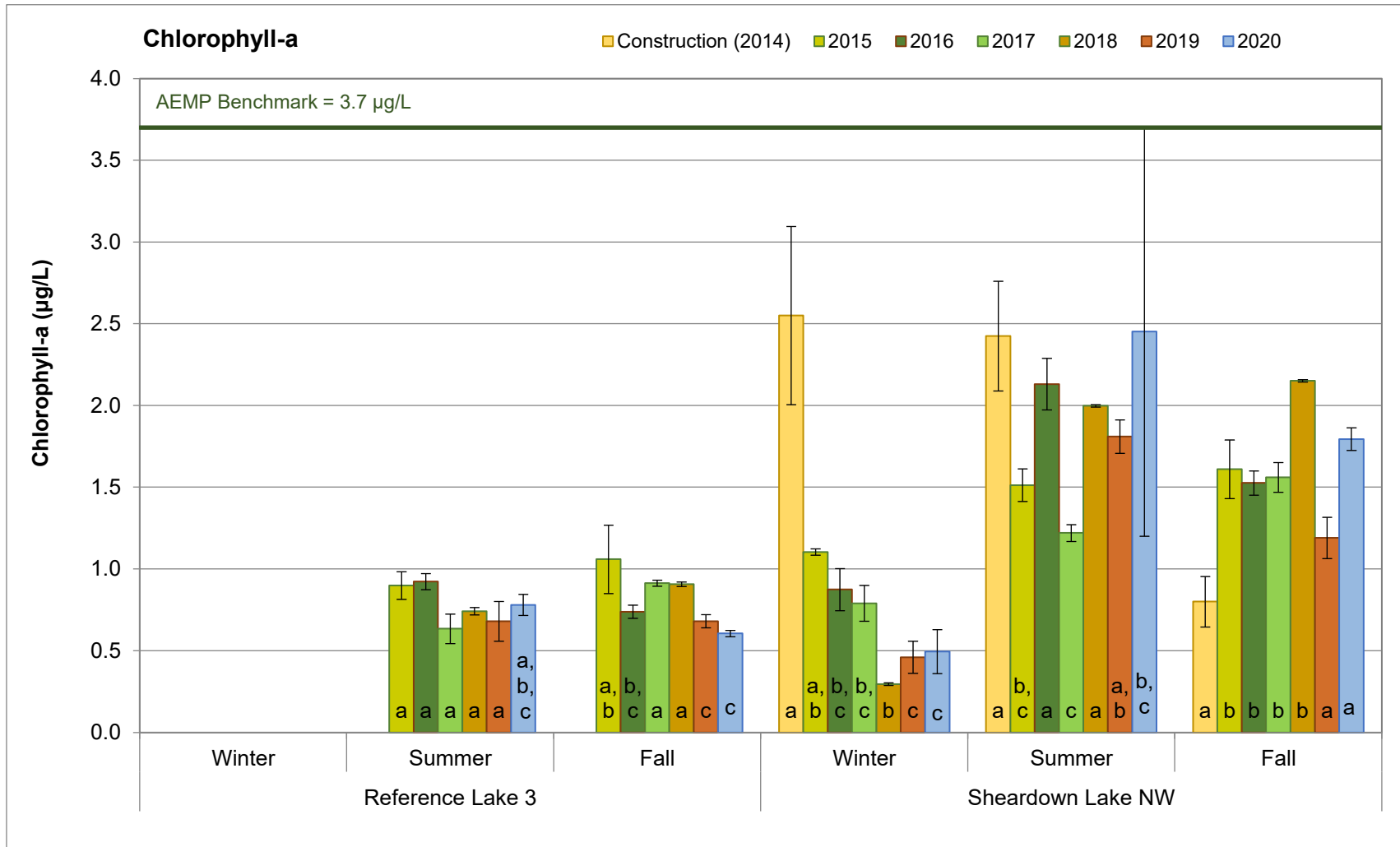


**Figure 4.9: Temporal Comparison of Chlorophyll-a Concentrations Among Seasons between Sheardown Lake NW and Reference Lake 3 for Mine Construction (2014) and Operational (2015 to 2020) Periods (mean  $\pm$  SE)**

Note: Bars with the same letter at the base do not differ significantly between years for the applicable season.

**Table 4.6: Benthic Invertebrate Community Statistical Comparison Results between Sheardown Lake NW (DLO-01) and Reference Lake 3 for Littoral Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics          |              |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|-----------------------------|--------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Littoral Habitat | Mean (n = 5) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | 0.003   | 11.8                                             | Reference Lake 3            | 1,571        | 430                | 193            | 1,190   | 1,474  | 2,310   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 6,631        | 3,914              | 1,750          | 2,250   | 6,457  | 12,500  |
| Richness (Number of Taxa)             | Mann Whitney             | rank                | NO                                    | 0.202   | 0.3                                              | Reference Lake 3            | 14.6         | 2.5                | 1.1            | 13.0    | 14.0   | 19.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 15.4         | 1.1                | 0.5            | 14.0    | 15.0   | 17.0    |
| Simpson's Evenness (E)                | t-equal                  | none                | NO                                    | 0.515   | -0.3                                             | Reference Lake 3            | 0.810        | 0.110              | 0.049          | 0.630   | 0.847  | 0.923   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 0.773        | 0.055              | 0.025          | 0.718   | 0.762  | 0.854   |
| Shannon Diversity                     | t-equal                  | log10               | NO                                    | 0.301   | -0.6                                             | Reference Lake 3            | 2.710        | 0.526              | 0.235          | 2.080   | 2.730  | 3.510   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 2.410        | 0.217              | 0.097          | 2.260   | 2.280  | 2.760   |
| Hydracarina (%)                       | t-equal                  | log10               | YES                                   | 0.065   | -1.0                                             | Reference Lake 3            | 5.3          | 2.6                | 1.2            | 3.5     | 4.4    | 9.9     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 2.6          | 3.5                | 1.6            | 0.2     | 0.3    | 8.1     |
| Ostracoda (%)                         | t-equal                  | log10               | NO                                    | 0.118   | -0.8                                             | Reference Lake 3            | 37.9         | 14.5               | 6.5            | 26.7    | 36.2   | 62.6    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 25.6         | 8.6                | 3.8            | 13.9    | 28.0   | 36.0    |
| Chironomidae (%)                      | t-equal                  | none                | YES                                   | 0.060   | 1.1                                              | Reference Lake 3            | 52.6         | 15.6               | 7.0            | 26.9    | 59.0   | 66.4    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 70.4         | 9.3                | 4.2            | 60.5    | 70.1   | 83.7    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | log10               | NO                                    | 0.101   | -1.4                                             | Reference Lake 3            | 28.8         | 9.5                | 4.3            | 15.6    | 32.5   | 38.7    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 15.4         | 14.3               | 6.4            | 2.3     | 14.4   | 36.4    |
| Collector-Gatherers (%)               | t-equal                  | none                | NO                                    | 0.114   | 1.3                                              | Reference Lake 3            | 63.1         | 11.4               | 5.1            | 53.6    | 60.3   | 81.5    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 77.5         | 14.1               | 6.3            | 54.2    | 83.5   | 90.8    |
| Filterers (%)                         | t-equal                  | log10               | NO                                    | 0.114   | -1.3                                             | Reference Lake 3            | 27.1         | 9.8                | 4.4            | 14.4    | 29.2   | 38.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 14.6         | 14.5               | 6.5            | 1.3     | 13.2   | 36.0    |
| Shredders (%)                         | t-unequal                | none                | YES                                   | 0.068   | -1.1                                             | Reference Lake 3            | 3.9          | 3.3                | 1.5            | 0.6     | 3.2    | 7.4     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 0.2          | 0.2                | 0.1            | 0.0     | 0.0    | 0.4     |
| Clingers (%)                          | t-equal                  | none                | YES                                   | < 0.001 | -2.5                                             | Reference Lake 3            | 31.9         | 9.3                | 4.2            | 17.9    | 33.5   | 41.6    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 8.5          | 3.8                | 1.7            | 3.7     | 9.6    | 12.5    |
| Sprawlers (%)                         | t-equal                  | none                | NO                                    | 0.176   | -0.8                                             | Reference Lake 3            | 57.9         | 12.1               | 5.4            | 41.0    | 57.2   | 73.8    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 48.4         | 7.7                | 3.5            | 40.3    | 47.1   | 57.5    |
| Burrowers (%)                         | t-equal                  | log10               | YES                                   | < 0.001 | 6.7                                              | Reference Lake 3            | 10.2         | 4.9                | 2.2            | 4.6     | 8.3    | 17.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Littoral       | 43.1         | 8.5                | 3.8            | 32.4    | 41.7   | 54.2    |

Grey shading indicates statistically significant difference between study areas based on p-value less than 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a CES of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

**Table 4.7: Benthic Invertebrate Community Statistical Comparison Results between Sheardown Lake NW (DLO-01) and Reference Lake 3 for Profundal Habitat Stations, Mary River Project CREMP, August 2019**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics           |                |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|------------------------------|----------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Profundal Habitat | Mean ( n = 5 ) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-unequal                | none                | YES                                   | 0.021   | 6.0                                              | Reference Lake 3             | 479            | 142                | 63             | 336     | 491    | 681     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 1,326          | 527                | 236            | 802     | 1,345  | 2,034   |
| Richness (Number of Taxa)             | t-equal                  | log10               | NO                                    | 0.581   | 0.4                                              | Reference Lake 3             | 7.0            | 1.9                | 0.8            | 5.0     | 8.0    | 9.0     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 7.8            | 2.5                | 1.1            | 6.0     | 7.0    | 12.0    |
| Simpson's Evenness (E )               | t-equal                  | none                | NO                                    | 0.103   | -5.5                                             | Reference Lake 3             | 0.731          | 0.045              | 0.020          | 0.689   | 0.721  | 0.795   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 0.486          | 0.295              | 0.132          | 0.236   | 0.324  | 0.872   |
| Shannon Diversity                     | t-equal                  | log10               | NO                                    | 0.199   | -1.9                                             | Reference Lake 3             | 1.800          | 0.196              | 0.088          | 1.580   | 1.720  | 2.030   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 1.420          | 0.891              | 0.398          | 0.677   | 0.961  | 2.720   |
| Hydracarina (%)                       | t-equal                  | log10(x+1)          | NO                                    | 0.839   | -0.1                                             | Reference Lake 3             | 2.8            | 2.0                | 0.9            | 0.0     | 3.5    | 5.1     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 2.6            | 0.9                | 0.4            | 1.3     | 3.1    | 3.2     |
| Ostracoda (%)                         | t-equal                  | none                | NO                                    | 0.434   | -0.5                                             | Reference Lake 3             | 8.6            | 4.1                | 1.8            | 3.5     | 7.7    | 14.5    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 6.6            | 3.9                | 1.7            | 1.1     | 5.9    | 11.7    |
| Chironomidae (%)                      | t-equal                  | log10               | NO                                    | 0.268   | 0.7                                              | Reference Lake 3             | 87.9           | 4.2                | 1.9            | 82.3    | 87.2   | 92.7    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 90.8           | 3.7                | 1.7            | 86.2    | 91.0   | 95.7    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | log10               | YES                                   | 0.002   | -1.6                                             | Reference Lake 3             | 31.5           | 17.6               | 7.9            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 4.0            | 4.0                | 1.8            | 1.3     | 2.6    | 11.1    |
| Collector-Gatherers (%)               | t-equal                  | none                | YES                                   | 0.003   | 1.9                                              | Reference Lake 3             | 62.9           | 15.0               | 6.7            | 45.4    | 56.1   | 79.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 91.9           | 3.5                | 1.6            | 86.8    | 91.7   | 96.6    |
| Filterers (%)                         | t-equal                  | none                | YES                                   | 0.008   | -1.6                                             | Reference Lake 3             | 30.7           | 17.5               | 7.8            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 2.4            | 4.9                | 2.2            | 0.0     | 0.0    | 11.1    |
| Clingers (%)                          | t-equal                  | log10               | YES                                   | 0.003   | -1.7                                             | Reference Lake 3             | 33.5           | 16.9               | 7.6            | 13.1    | 41.5   | 52.8    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 5.2            | 4.2                | 1.9            | 1.3     | 3.2    | 12.1    |
| Sprawlers (%)                         | t-equal                  | none                | NO                                    | 0.786   | 0.3                                              | Reference Lake 3             | 64.8           | 16.2               | 7.2            | 45.5    | 58.5   | 87.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 69.9           | 36.7               | 16.4           | 16.1    | 94.2   | 97.5    |
| Burrowers (%)                         | t-equal                  | log10(x+1)          | NO                                    | 0.146   | 8.1                                              | Reference Lake 3             | 1.7            | 2.9                | 1.3            | 0.0     | 0.0    | 6.7     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown NW Profundal       | 24.9           | 32.6               | 14.6           | 1.3     | 2.6    | 71.8    |

Grey shading indicates a statistically significant difference between study areas based on p-value less than 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a CES of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

occurrence of no ecologically significant differences in the relative abundance of metal-sensitive chironomids and FFG between lakes (Tables 4.6 and 4.7), which indicated no sediment metal-related influences or effects to available food resources, respectively, on the benthic invertebrate community of Sheardown Lake NW in 2020. Similar to Camp Lake, sediment at Sheardown Lake NW littoral and profundal stations was significantly more compact (i.e., lower moisture content) than like-habitat stations at the reference lake, which potentially contributed to differences in relative abundance of HPG between lakes (Tables 4.6 and 4.7; Appendix Table F.35).

No significant differences in benthic invertebrate density, richness, evenness, relative abundance of dominant groups, and relative abundance of FFG were consistently shown for Sheardown Lake NW littoral stations over years of mine operation (2015 to 2020) compared to baseline studies conducted in 2007, 2008, and 2013 (Appendix Figure F.10; Appendix Table F.37). At profundal stations of Sheardown Lake NW, only the relative abundance of metal-sensitive Chironomidae routinely differed significantly between the mine operational period and both years of mine baseline (Appendix Table F.38). However, because greater relative abundance of metal-sensitive Chironomidae were observed in years of mine operation compared to baseline (Appendix Figure F.11), this temporal difference was not indicative of an adverse effect on the benthic invertebrate community at Sheardown Lake NW. Therefore, consistent with no substantial changes in water and sediment quality since the mine baseline period, no significant differences in benthic invertebrate community features were indicated at littoral and profundal habitat of Sheardown Lake NW since the commencement of commercial mine operation in 2015.

#### **4.2.5 Fish Population**

##### **4.2.5.1 Sheardown Lake NW Fish Community**

The fish community of Sheardown Lake NW included arctic charr and ninespine stickleback in 2020 (Table 4.8), reflecting the same fish species that were observed historically (Minnow 2020). Arctic charr and ninespine stickleback CPUE were higher at Sheardown Lake NW than at the reference lake in 2020 (Table 4.8), suggesting higher densities and/or productivity of these species at Sheardown Lake NW. A greater relative abundance of fish, together with higher chlorophyll-a concentrations and greater benthic invertebrate density, suggested that overall biological productivity was higher at Sheardown Lake NW than at Reference Lake 3. Arctic charr electrofishing CPUE at Sheardown Lake NW in 2020 was within the range observed over the mine baseline period (2007 to 2013) and previous years of mine operation (2015 to 2019; Figure 4.10). Gill netting CPUE for arctic charr in 2020 was also within the range observed during baseline, but slightly greater than the previous five years of mine operation (Figure 4.10). The similarities in CPUE among study years suggested that the relative abundance of arctic charr



**Table 4.8: Fish Catch and Community Summary from Backpack Electrofishing and Gill Netting Conducted at Sheardown Lake NW (DLO-01), Sheardown Lake SE (DLO-02) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

| Lake                     | Method <sup>a</sup> |            | Arctic Charr | Ninespine Stickleback | Total by Method | Total No. of Species |
|--------------------------|---------------------|------------|--------------|-----------------------|-----------------|----------------------|
| Reference Lake 3         | Electrofishing      | No. Caught | 134          | 1                     | 135             | 2                    |
|                          |                     | CPUE       | 2.09         | 0.016                 | 2.11            |                      |
|                          | Gill netting        | No. Caught | 0            | 0                     | 0               |                      |
|                          |                     | CPUE       | 0.956        | 0                     | 0.956           |                      |
| Sheardown Lake Northwest | Electrofishing      | No. Caught | 118          | 6                     | 124             | 2                    |
|                          |                     | CPUE       | 4.46         | 0.227                 | 4.69            |                      |
|                          | Gill netting        | No. Caught | 98           | 0                     | 98              |                      |
|                          |                     | CPUE       | 3.34         | 0                     | 3.34            |                      |
| Sheardown Lake Southeast | Electrofishing      | No. Caught | 115          | 63                    | 178             | 2                    |
|                          |                     | CPUE       | 4.28         | 2.35                  | 6.63            |                      |
|                          | Gill netting        | No. Caught | 107          | 0                     | 107             |                      |
|                          |                     | CPUE       | 3.81         | 0                     | 3.81            |                      |

<sup>a</sup> Catch-per-unit-effort (CPUE) for electrofishing represents the number of fish captured per electrofishing minute, and for gill netting represents the number of fish captured per 100 m hours of net.

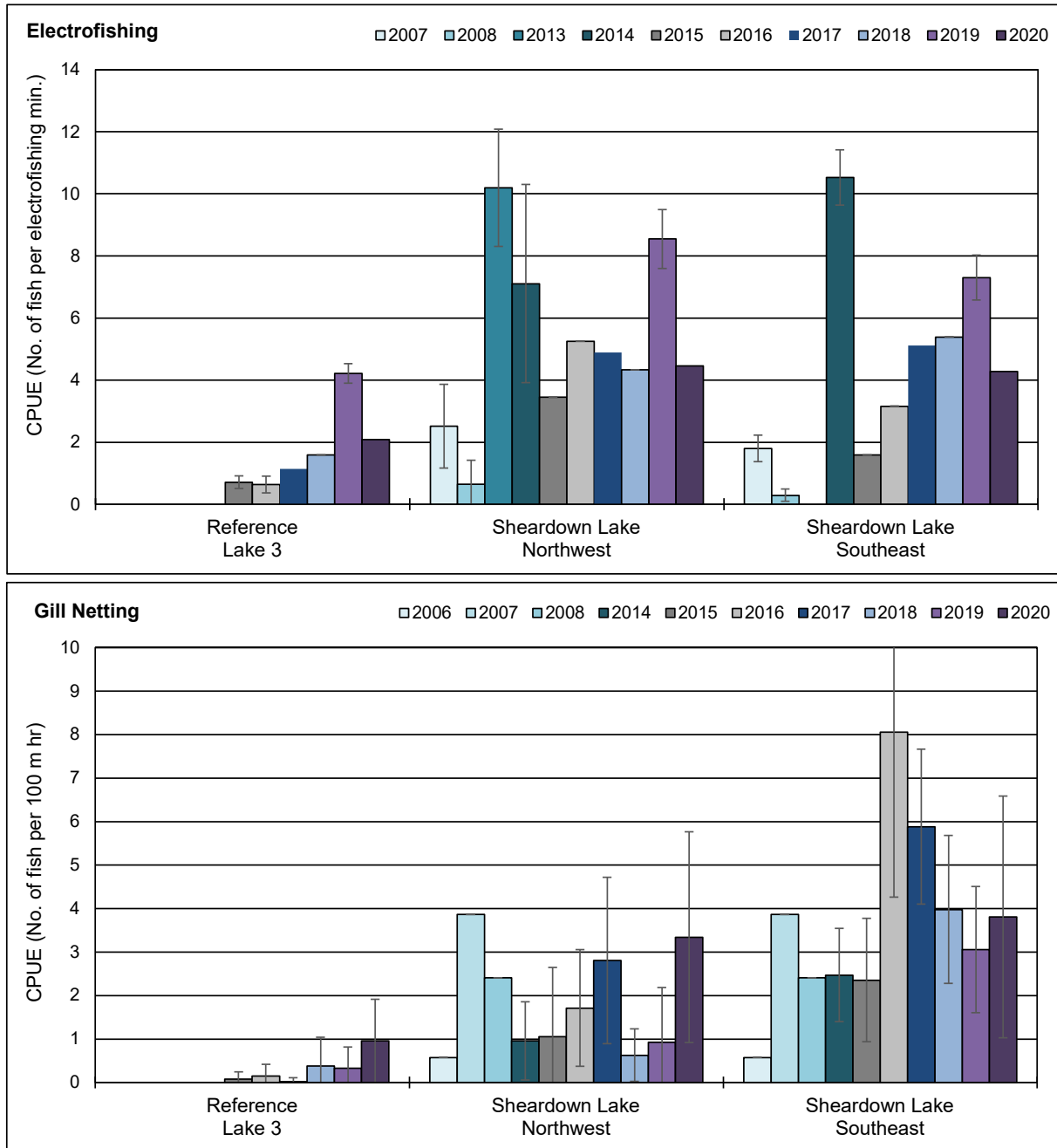


**Figure 4.10: Catch-per-unit-effort (CPUE; mean  $\pm$  SD) of Arctic Charr Captured by Back-pack Electrofishing and Gill Netting at Sheardown Lake NW (DLO-01) and Sheardown Lake SE (DLO-02), Mary River Project CREMP, 2006 to 2020**

Notes: Data presented for fish sampling conducted in fall during baseline (2006, 2007, 2008, 2013), construction (2014) and operational (2015 to 2020) mine phases. Lake basins (i.e., NW or SE) were not differentiated historically for baseline gill netting catches.



at the nearshore and littoral/profundal habitats of Sheardown Lake NW has remained similar over time, suggesting the mine has not influenced the size of the arctic charr population in the lake.

#### 4.2.5.2 Sheardown Lake NW Fish Population Assessment

##### Nearshore Arctic Charr

A total of 100 arctic charr were captured from nearshore habitat of each of Sheardown Lake NW and Reference Lake 3 in August 2020. Distinguishing arctic charr YOY from the older, non-YOY age class was possible using a fork length cut-off of 4.8 cm and 4.3 cm for the Sheardown Lake NW and Reference Lake 3 data sets, respectively, based on evaluation of length-frequency distributions coupled with supporting age determinations (Figure 4.11; Appendix Tables G.4 and G.13). Because greater than ten YOY arctic charr were identified from the Sheardown Lake NW and Reference Lake 3 populations, statistical comparisons of health endpoints were completed separately on both the YOY and non-YOY populations. Length-frequency distributions for the nearshore arctic charr (based on the full dataset, and non-YOY only) differed significantly between Sheardown Lake NW and Reference Lake 3 (Table 4.9). This was primarily due to a greater number of non-YOY and larger fish being captured at Sheardown Lake NW compared to the reference lake (Figure 4.11). Both YOY and non-YOY arctic charr from nearshore habitats in Sheardown Lake NW were significantly larger and had greater condition than those from the reference lake (Table 4.9; Appendix Table G.14). However, the magnitudes of the differences in condition between lakes for both the YOY and non-YOY populations were not considered ecologically significant because they were within  $CES_C$  (i.e.,  $\pm 10\%$ ; Table 4.9; Appendix Table G.14).

Temporal comparisons of nearshore arctic charr populations between Sheardown Lake NW and Reference Lake 3 generally indicated non-YOY were significantly larger but showed no consistent difference/direction of difference in condition at Sheardown Lake NW since 2015 (Table 4.9). Although the lengths and weights of non-YOY arctic charr in years of mine operation (i.e., 2015 to 2020) have not differed consistently relative to the baseline period at Sheardown Lake NW, the condition of non-YOY arctic charr in all years of mine operation has been significantly lower than baseline at magnitudes near or outside of  $CES_C$  (i.e.,  $\pm 10\%$ ; Table 4.9). The inconsistent response of non-YOY arctic charr between Sheardown Lake NW and Reference Lake 3 since 2015 compared to between years of mine operation and baseline at Sheardown Lake NW resulted in uncertainty as to whether current mine operations have affected non-YOY arctic charr health at Sheardown Lake NW.



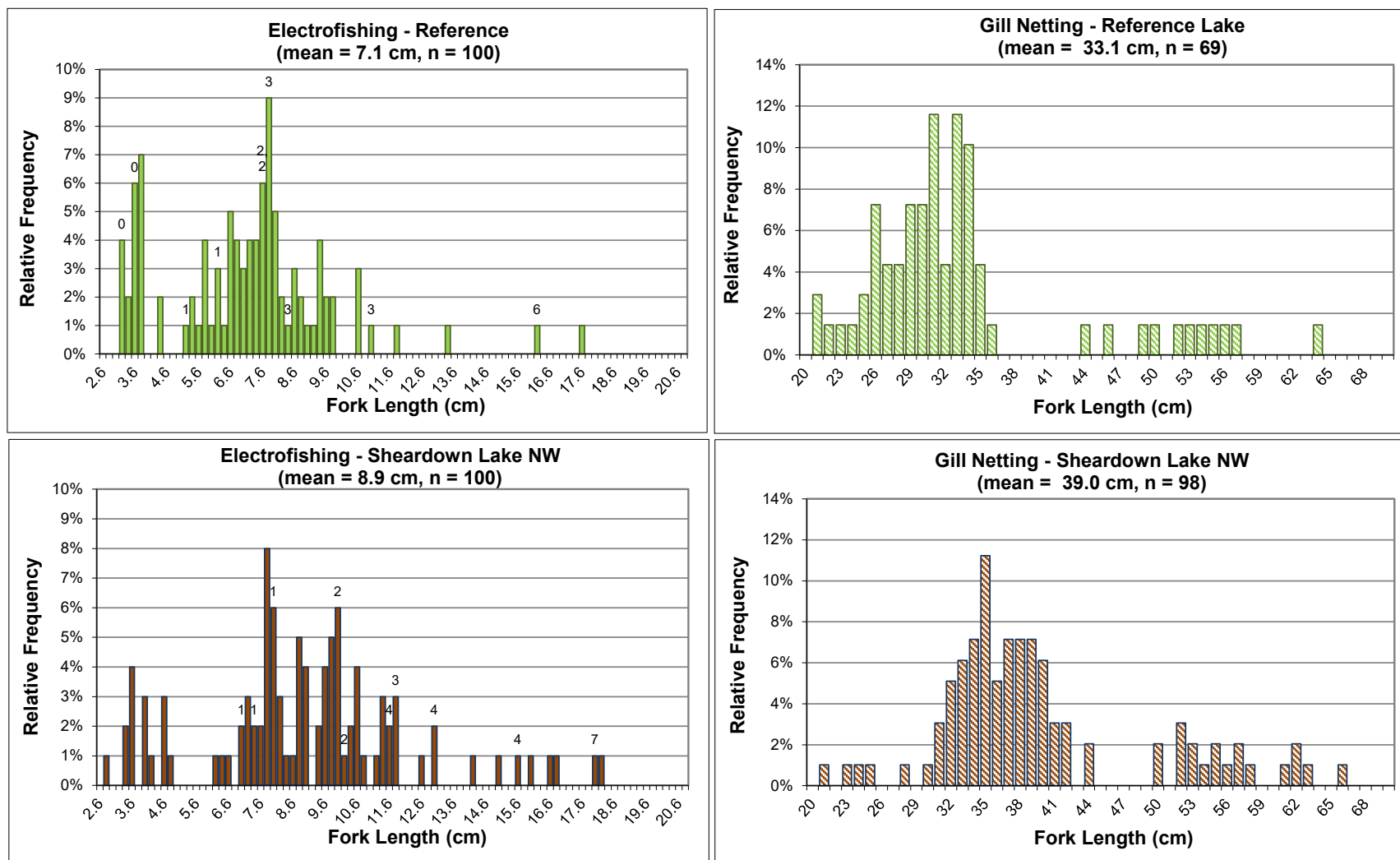


**Figure 4.11: Length-Frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Sheardown Lake NW (DLO-01) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

Note: Fish ages are shown above the bars, where available.

**Table 4.9: Summary of Statistical Results for Arctic Charr Population Comparisons between Sheardown Lake NW and Reference Lake 3 from 2015 to 2020, and between Sheardown Lake NW Mine Operational and Baseline Period Data, for Fish Captured by Electrofishing and Gill Netting Methods, Mary River Project CREMP**

| Data Set by Sampling Method                  | Response Category        | Endpoint                               | Statistically Significant Differences Observed? <sup>a</sup> |            |            |            |            |            |                                                            |            |            |            |            |            |
|----------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------------------------|------------|------------|------------|------------|------------|------------------------------------------------------------|------------|------------|------------|------------|------------|
|                                              |                          |                                        | versus Reference Lake 3                                      |            |            |            |            |            | versus Sheardown Lake NW baseline period data <sup>b</sup> |            |            |            |            |            |
|                                              |                          |                                        | 2015                                                         | 2016       | 2017       | 2018       | 2019       | 2020       | 2015                                                       | 2016       | 2017       | 2018       | 2019       | 2020       |
| Nearshore Electrofishing                     | Survival                 | Length-Frequency Distribution          | Yes                                                          | Yes        | Yes        | Yes        | Yes        | Yes        | Yes                                                        | Yes        | Yes        | Yes        | Yes        | Yes        |
|                                              |                          | Age                                    | No                                                           | No         | No         | -          | -          | -          | No                                                         | -          | -          | -          | -          | -          |
|                                              | Energy Use (non-YOY)     | Size (mean fork length)                | Yes (+29%)                                                   | Yes (+17%) | Yes (+20%) | Yes (+24%) | Yes (-10%) | Yes (+22%) | No                                                         | No         | No         | Yes (-12%) | No         | Yes (+13%) |
|                                              |                          | Size (mean weight)                     | Yes (+121%)                                                  | Yes (+60%) | No         | Yes (+83%) | Yes (-24%) | Yes (+99%) | No                                                         | Yes (-29%) | No         | Yes (-50%) | No         | No         |
|                                              | Energy Storage (non-YOY) | Condition (body weight-at-fork length) | Yes (+3%)                                                    | No         | Yes (+7%)  | Yes (-5%)  | Yes (+4%)  | Yes (+10%) | Yes (-13%)                                                 | Yes (-12%) | Yes (-9%)  | Yes (-10%) | Yes (-13%) | Yes (-9%)  |
| Littoral/Profundal Gill Netting <sup>c</sup> | Survival                 | Length Frequency Distribution          | -                                                            | -          | -          | No         | Yes        | Yes        | Yes                                                        | Yes        | Yes        | No         | Yes        | No         |
|                                              |                          | Age                                    | -                                                            | -          | -          | -          | -          | -          | Yes (-35%)                                                 | Yes (-28%) | Yes (-26%) | -          | -          | -          |
|                                              | Energy Use               | Size (mean fork length)                | -                                                            | -          | -          | No         | Yes (+22%) | Yes (+18%) | Yes (-21%)                                                 | Yes (-14%) | Yes (-6%)  | No         | No         | No         |
|                                              |                          | Size (mean weight)                     | -                                                            | -          | -          | No         | Yes (+92%) | Yes (+94%) | Yes (-47%)                                                 | Yes (-31%) | Yes (-9%)  | No         | No         | No         |
|                                              |                          | Growth (fork length-at-age)            | -                                                            | -          | -          | -          | -          | -          | No                                                         | No         | No         | -          | -          | -          |
|                                              |                          | Growth (weight-at-age)                 | -                                                            | -          | -          | -          | -          | -          | No                                                         | No         | Yes (+24%) | -          | -          | -          |
|                                              | Energy Storage           | Condition (body weight-at-fork length) | -                                                            | -          | -          | Yes (+4%)  | No         | Yes (+11%) | Yes (+8%)                                                  | Yes (+11%) | Yes (+6%)  | No         | No         | No         |

**BOLD** indicates a significant difference related to the comparison.

<sup>a</sup> Values in parentheses indicate direction and magnitude of any significant differences.

<sup>b</sup> Baseline period data included 2002, 2005, 2006, 2008, and 2013 nearshore electrofishing data and 2006, 2008 and 2013 littoral/profundal gill netting data.

<sup>c</sup> Due to low catches of arctic charr in gill nets at Reference Lake 3 in 2015, 2016, and 2017, no comparison of fish health was conducted for gill netted fish.

## Littoral/Profundal Arctic Charr

A total of 98 and 69 arctic charr were sampled from littoral/profundal habitat of Sheardown Lake NW and Reference Lake 3, respectively, in August 2020. The length-frequency distribution for littoral/profundal arctic charr differed significantly between lakes based on greater numbers of larger fish captured at Sheardown Lake NW (Table 4.9; Figure 4.11). Arctic charr captured by gill net at Sheardown Lake NW in 2020 were significantly larger and had greater condition than those captured at Reference Lake 3 (Table 4.9; Appendix Table G.18). The magnitude of difference in condition (11%) was slightly outside of the  $CES_C$  of  $\pm 10\%$ , suggesting a potentially ecologically meaningful difference.

The differences in size and condition of arctic charr captured from littoral/profundal habitat between Sheardown Lake NW and Reference Lake 3 in 2020 were similar to the differences shown in 2018 and/or 2019, suggesting no appreciable changes in health of littoral/profundal arctic charr at Sheardown Lake NW over time. No significant differences in body size or condition of arctic charr captured from littoral/profundal habitat of Sheardown Lake NW were observed from 2018 to 2020 relative to the baseline period (Table 4.9; Appendix Figure G.10; Appendix Table G.18). From 2015 to 2017, arctic charr sampled from littoral/profundal habitat of Sheardown Lake NW were significantly shorter, lighter, and of greater condition than those captured during the baseline period (Table 4.9). The absence of differences in size and condition of arctic charr from Sheardown Lake NW over the 2018 to 2020 period compared to baseline appeared to reflect closer comparability in fish size between the most recent studies and baseline. In turn, this suggested that assessment of littoral/profundal arctic charr health should use sampling methods that reduce variability in the size of fish sampled to assess potential mine-related effects. Nevertheless, the general absence of consistent ecologically significant differences in condition of arctic charr captured at littoral/profundal areas of Sheardown Lake NW from 2018 to 2020 compared to Reference Lake 3 and Sheardown Lake NW baseline suggested no adverse mine-related influences on the adult arctic charr population of the lake as a result of mine operations.

### 4.2.6 Effects Assessment and Recommendations

At Sheardown Lake NW, the following AEMP benchmarks were exceeded in 2020:

- Arsenic concentration in sediment was greater than the benchmark of 6.2 mg/kg at one littoral monitoring station (DD-HAB 9-STN2), although the average concentration of arsenic in sediment at littoral stations was below this benchmark;
- Iron concentration in sediment was greater than the benchmark of 52,200 mg/kg at one littoral station (DD-HAB 9-STN2) and one profundal station (DL0-01-5), although average



concentrations of iron in sediment at littoral and profundal stations were below this benchmark;

- Manganese concentration in sediment was greater than the benchmark of 4,530 mg/kg at two profundal stations (DL0-01-2 and DL0-01-5), although the average concentration of manganese in sediment at profundal stations was below this benchmark; and,
- Nickel concentration in sediment was greater than the benchmark of 77 mg/kg at one littoral monitoring station (DD-HAB 9-STN2), although the average concentration of nickel in sediment at littoral stations was below this benchmark.

No AEMP benchmarks for water quality were exceeded over the duration of spring, summer, and fall sampling events in 2020 at Sheardown Lake NW. Lake-specific AEMP benchmarks for sediment quality were exceeded for arsenic, iron, manganese, and nickel at as many as one littoral station and two profundal stations in 2020, but none of these metals were elevated in the sediment of Sheardown Lake NW compared to the reference lake and to concentrations at Sheardown Lake NW during baseline. No adverse effects to phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at Sheardown Lake NW in 2020 based on comparisons to reference conditions and to Sheardown Lake NW baseline conditions. Because no mine-related changes in metal concentrations occurred in sediment at Sheardown Lake NW in 2020, and no adverse effects to biota were associated with concentrations of metals above AEMP benchmarks for sediment quality, a low action response is recommended to meet obligations under the AEMP Management Response Framework for Sheardown Lake NW. Specifically, it is recommended that, because concentrations of metals in Sheardown Lake NW sediment have been similar to those shown at the reference lake, consideration should be given to updating the AEMP sediment quality benchmarks for Sheardown Lake NW to reflect not only baseline data, but also reference lake data.

### **4.3 Sheardown Lake Southeast (DLO-2)**

#### **4.3.1 Water Quality**

Vertical profiles of *in situ* water temperature, dissolved oxygen, pH and specific conductance conducted at Sheardown Lake SE showed no substantial within-season station-to-station differences during any of the winter, summer, or fall sampling events in 2020 (Appendix Figures C.17 to C.20). Distinctly cooler water temperature was indicated with depth at the Sheardown Lake SE basin in the summer, as well as at depths greater than 10 metres in the fall, that roughly mirrored gradients observed at Reference Lake 3 during both seasons in 2020 (Figure 4.12). The average water temperature at the bottom of the water column at Sheardown Lake SE littoral stations did not differ significantly from that at the reference lake, unlike at profundal stations



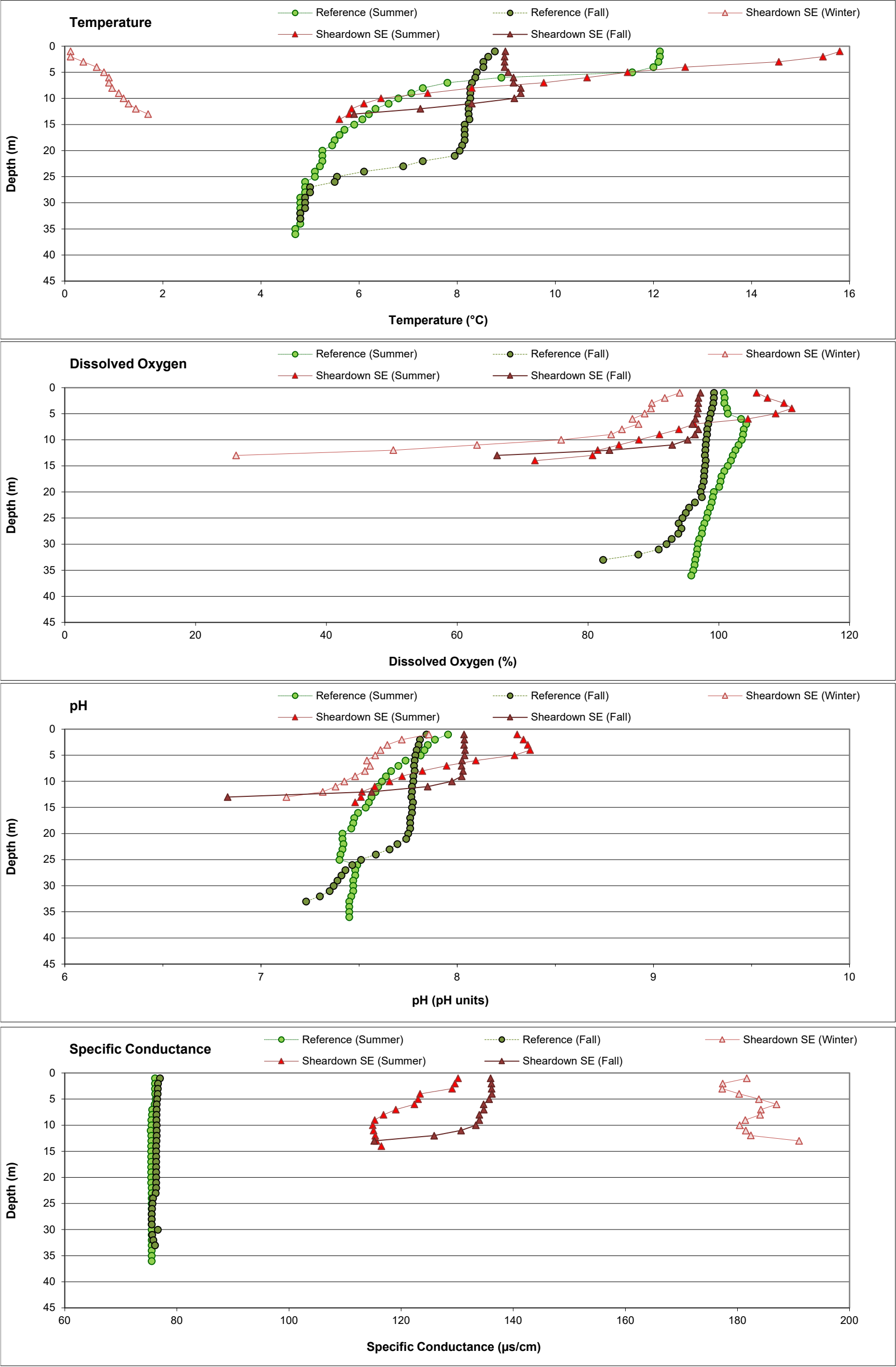


**Figure 4.12:** Average *In Situ* Water Quality with Depth from Surface at Sheardown Lake SE (DLO-02) Compared to Reference Lake 3 during Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020



where the water temperature was significantly warmer than at Reference Lake 3 during the August 2020 biological study (Figure 4.5; Appendix Table C.51). Sheardown Lake SE is a smaller and shallower waterbody than Reference Lake 3 (see Figure 2.1; Appendix Table B.1), and therefore heat distribution patterns (i.e., thermal profiles) may be expected to differ naturally between these lakes. Dissolved oxygen profiles conducted at Sheardown Lake SE in 2020 showed a gradient of decreasing saturation levels with increased depth in all but the fall sampling event (Figure 4.12). Dissolved oxygen concentrations near the bottom of the water column were significantly lower at Sheardown Lake SE littoral and profundal stations than like habitat stations at the reference lake during the August 2020 biological study (Figure 4.5). However, mean dissolved oxygen concentrations were above the WQG for the protection of sensitive populations of cold-water species (i.e., 9.5 mg/L) near the bottom at littoral and profundal stations of Sheardown Lake SE at the time of biological monitoring (Figure 4.5; Appendix Table C.51).

Water column profiles showed decreasing pH with increased depth at Sheardown Lake SE and Reference Lake 3 during winter and summer sampling events in 2020, with the changes in pH through the water column at both lakes appearing to coincide with changes in water temperature during each given season (Figure 4.12). The pH near the bottom of the water column at littoral and profundal stations of Sheardown Lake SE were significantly higher than at respective stations at the reference lake during the August 2020 biological study (Figure 4.5). However, the mean incremental difference in bottom pH between lakes was less than a pH unit, and pH values were consistently within WQG limits at Sheardown Lake SE (Figure 4.5; Appendix Table C.51), suggesting that the pH difference between lakes was not ecologically meaningful. Specific conductance at Sheardown Lake SE differed between the bottom and surface of the water column in all seasons (Figure 4.12), and was significantly higher at the littoral and profundal stations of Sheardown Lake SE than at Reference Lake 3 during the August 2020 biological study (Figure 4.5). Secchi depth at Sheardown Lake SE was significantly lower, indicating lower water clarity, than at the reference lake during the August 2020 biological study (Appendix Figure C.8; Appendix Tables C.51). Indeed, water clarity at Sheardown Lake SE was the lowest among all study lakes used for the CREMP in 2020 and historically, which is hypothesized to reflect backflow containing naturally high suspended sediment received from Mary River.

Water chemistry at Sheardown Lake SE met all AEMP benchmarks and WQG over the duration of spring, summer, and fall sampling events in 2020 (Table 4.10). Among those parameters with established AEMP benchmarks, aluminum and nitrate concentrations were elevated by factors greater than three at Sheardown Lake SE compared to Reference Lake 3 during the summer and fall sampling events (Table 4.10; Appendix Table C.43). Of those parameters without AEMP benchmarks, turbidity and total and dissolved manganese, molybdenum, and uranium



Table 4.10: Mean Water Chemistry at Sheardown Lake SE (DLO-02) and Reference Lake 3 (REF3) Monitoring Stations<sup>a</sup> During Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>b</sup> | AEMP Benchmark <sup>c</sup> | Reference Lake 3 (n = 3) |          | Sheardown Lake SE Stations (n = 5) |          |          |
|---------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|--------------------------|----------|------------------------------------|----------|----------|
|                           |                                    |         |                                            |                             | Summer                   | Fall     | Winter                             | Summer   | Fall     |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                           | 79                       | 79       | 194                                | 128      | 142      |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.66                     | 7.75     | 7.44                               | 8.02     | 8.01     |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 35                       | 38       | 101                                | 60       | 68       |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.0                      | 2.0      | 2.0                                | 2.0      | 2.2      |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 41                       | 51       | 129                                | 69       | 77       |
|                           | Turbidity                          | NTU     | -                                          | -                           | 0.15                     | 0.15     | 0.23                               | 0.94     | 2.32     |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 46                       | 34       | 79                                 | 49       | 56       |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.010                    | 0.014    | 0.018                              | 0.007    | 0.013    |
|                           | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                    | 0.020    | 0.230                              | 0.095    | 0.089    |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                    | 0.005    | 0.005                              | 0.002    | 0.005    |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.15                     | 0.16     | 0.15                               | 0.13     | 0.15     |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.3                      | 3.5      | 2.7                                | 2.0      | 2.1      |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.6                      | 3.8      | 2.7                                | 1.7      | 2.4      |
|                           | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.004                    | 0.003    | 0.004                              | 0.006    | 0.009    |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | 0.0010                   | 0.0011   | 0.001                              | 0.0026   | 0.001    |
|                           | Bromide (Br)                       | mg/L    | -                                          | -                           | 0.1                      | 0.1      | 0.1                                | 0.05     | 0.1      |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.4                      | 1.4      | 5.4                                | 3.3      | 3.9      |
|                           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 3.6                      | 3.6      | 12.4                               | 9.2      | 9.6      |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>d</sup>   | 0.0031                   | 0.003    | 0.006                              | 0.026    | 0.064    |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.0001                   | 0.0001   | 0.000101                           | 0.0001   | 0.0001   |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0064                   | 0.00696  | 0.01100                            | 0.00641  | 0.00776  |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | 0.0005                   | 0.0005   | 0.0005                             | 0.0001   | 0.0005   |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                   | 0.0005   | 0.0005                             | 0.00005  | 0.0005   |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                     | 0.01     | 0.0116                             | 0.01     | 0.0114   |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | 0.00001                  | 0.00001  | 0.00001                            | 0.000005 | 0.00001  |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.2                      | 7.2      | 19.1                               | 11.3     | 13.4     |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.0005                   | 0.0005   | 0.0005                             | 0.00013  | 0.0005   |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00073                  | 0.0008   | 0.0010                             | 0.0008   | 0.0009   |
|                           | Iron (Fe)                          | mg/L    | 0.300                                      | 0.300                       | 0.030                    | 0.030    | 0.030                              | 0.034    | 0.064    |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.00005                  | 0.00005  | 0.00005                            | 0.00005  | 0.00006  |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                   | 0.001    | 0.0013                             | 0.0011   | 0.0013   |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.2                      | 4.7      | 12.9                               | 6.9      | 8.3      |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00080                  | 0.00068  | 0.00233                            | 0.00526  | 0.00361  |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.000005                 | 0.000005 | 0.000005                           | 0.000005 | 0.000005 |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00013                  | 0.00015  | 0.00083                            | 0.00063  | 0.00064  |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                  | 0.00050  | 0.00083                            | 0.00059  | 0.00061  |
|                           | Potassium (K)                      | mg/L    | -                                          | -                           | 0.9                      | 0.90     | 1.69                               | 1.03     | 1.15     |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.001                    | 0.001    | 0.001                              | 0.00005  | 0.001    |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.50                     | 0.50     | 0.74                               | 0.55     | 0.50     |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.00001                  | 0.00001  | 0.00001                            | 0.00001  | 0.00001  |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.9                      | 0.96     | 2.46                               | 1.37     | 1.71     |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0084                   | 0.0082   | 0.0156                             | 0.0086   | 0.0102   |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.0001                   | 0.0001   | 0.0001                             | 0.00001  | 0.0001   |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.0001                   | 0.0001   | 0.0001                             | 0.0001   | 0.0001   |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.010                    | 0.010    | 0.010                              | 0.001    | 0.010    |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00032                  | 0.00033  | 0.00135                            | 0.00089  | 0.00118  |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | 0.0010                   | 0.001    | 0.001                              | 0.0005   | 0.001    |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                   | 0.003    | 0.004                              | 0.003    | 0.003    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Values presented are averages from samples taken from the surface and the bottom of the water column at each lake for the indicated season.

<sup>b</sup> Canadian Water Quality Guideline (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>c</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake NW.

<sup>d</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively (Intrinsik 2013).

concentrations were elevated at Sheardown Lake SE compared to the reference lake during summer and/or fall sampling events in 2020 (Appendix Tables C.43 and C.54). Similar to the northwest basin of the lake, elevated total aluminum concentrations at Sheardown Lake SE compared to the reference lake in 2020 were associated with influences on water quality of the lake due to backflow received from Mary River that contributed to elevated turbidity at Sheardown Lake SE (Table 4.10; Appendix Table C.43).<sup>9</sup> Similar dissolved aluminum concentrations between Sheardown Lake SE and the reference lake in 2020 (and historically) suggested that the mine was unlikely to be the source of aluminum (Appendix Table C.54). Sulphate was the only parameter among those with established AEMP benchmarks that was elevated in 2020 compared to baseline at Sheardown Lake SE (Appendix Figure C.21), as was dissolved molybdenum concentrations among those parameters without AEMP benchmarks (Appendix Tables C.43 and C.54). Overall, a slight mine-related influence on water quality of Sheardown Lake SE was indicated in 2020 as reflected by elevated concentrations of manganese, molybdenum, nitrate, sulphate, and uranium. With the exception of manganese, concentrations of these parameters were also elevated at Sheardown Lake NW, suggesting a common mine-related source. However, concentrations of all parameters remained well below AEMP benchmarks and WQG at Sheardown Lake SE since commercial mine operations commenced in 2015, and therefore no adverse effects to biota were expected at the southeast basin of Sheardown Lake.

#### 4.3.2 Sediment Quality

Surficial sediment at Sheardown Lake SE was primarily composed of silt with low (i.e., <2%) TOC content (Figure 4.13; Appendix Table D.30). Substrate at littoral stations of Sheardown Lake SE contained significantly less sand, moisture, and TOC content, and significantly greater silt and clay content, compared to littoral stations at Reference Lake 3 (Appendix Table D.31). Sediments from profundal stations at Sheardown Lake SE also had lower TOC and moisture content compared to profundal stations at Reference Lake 3, but no significant differences in particle size occurred (Appendix Table D.31). The relatively high proportion of fines in substrate of Sheardown Lake SE is potentially due to the receipt of Mary River backflow during high flow periods, which can be expected to result in the deposition of high quantities of naturally suspended, fine-grained material. Similar to observations at the other mine-exposed lakes and the reference lake, iron (oxy)hydroxide material was visible in surficial and/or sub-surface substrate at some Sheardown Lake SE stations, in some cases occurring as a thin, distinct layer or floc (Appendix Tables D.28 and D.29). Below the surficial layer, substrates at Sheardown Lake SE exhibited some sporadic blackening suggesting development of reducing conditions; however, no distinct redox boundary was observed (Appendix Tables D.28 and D.29). Observations regarding reducing sediment conditions at Sheardown Lake SE were similar to



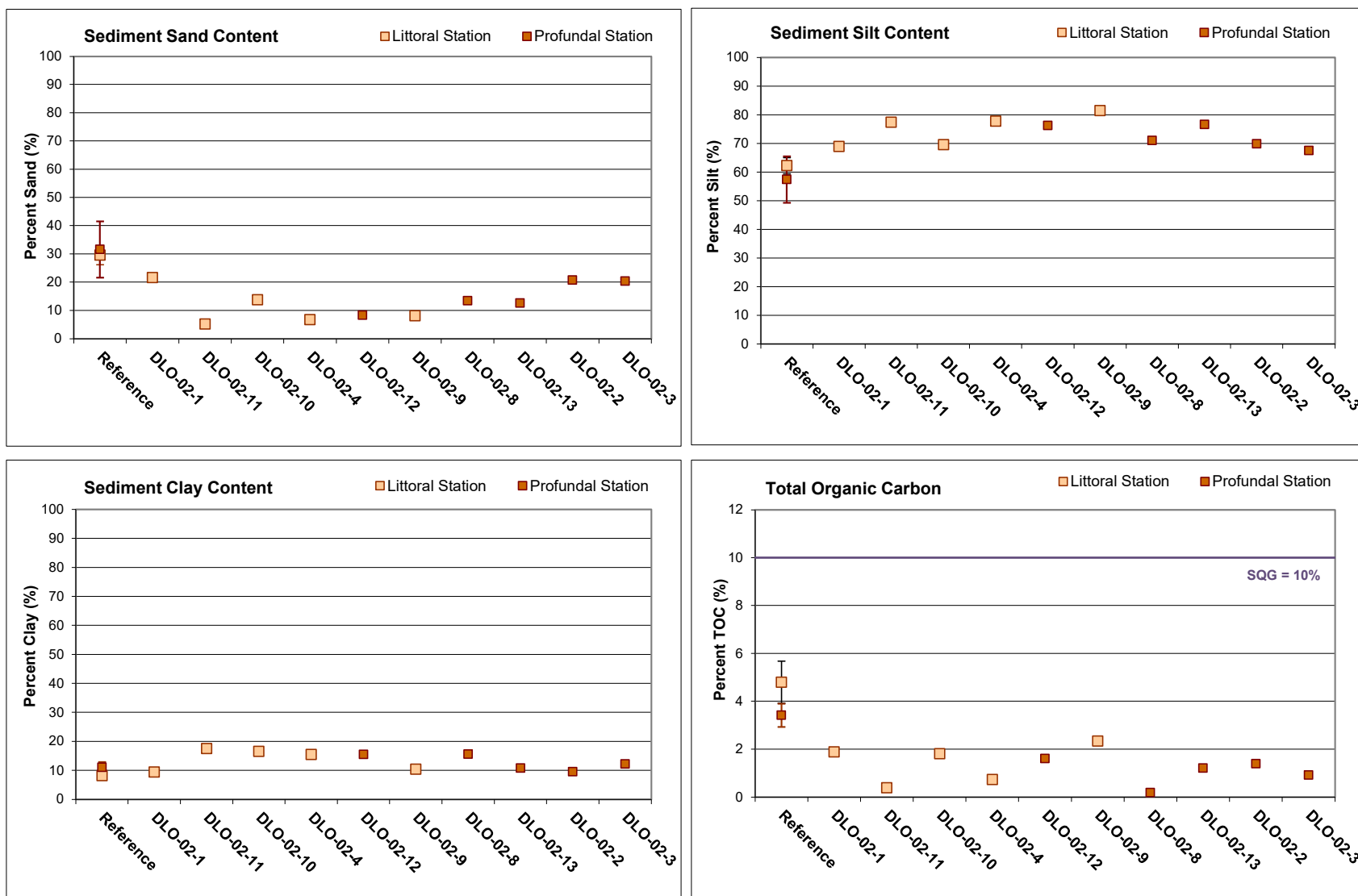


**Figure 4.13: Sediment Particle Size and Total Organic Carbon (TOC) Content Comparisons among Sheardown Lake SE (DLO-02) Sediment Monitoring Stations and Reference Lake 3 Averages (mean  $\pm$  SE), Mary River Project CREMP, August 2020**

those made at Reference Lake 3 (Appendix Tables D.3, D.4, D.28, and D.29), suggesting that factors leading to reduced sediment conditions were comparable between lakes.

Metal concentrations in sediment at Sheardown Lake SE showed no clear spatial gradients with progression towards the lake outlet in 2020, suggesting no point sources of metals to the lake (Appendix Table D.30). Metal concentrations were, on average, similar to those observed for like-habitat stations at Reference Lake 3, except for a slight elevation (i.e., 3- to 5-fold) of zirconium concentrations in sediment from Sheardown Lake SE (Table 4.11; Appendix Table D.32). On average, concentrations of iron were above the SQG in Sheardown Lake SE (Table 4.11; Appendix Table D.30). Mean concentrations of iron, as well as chromium and manganese (the latter two metals in sediment from littoral stations only), were also above AEMP benchmarks in sediment in 2020 (Table 4.11; Appendix Table D.30). However, as indicated previously, average concentrations of iron and manganese were also above SQG and AEMP benchmarks at littoral and/or profundal stations of Reference Lake 3 (Table 4.11). This suggested that the elevation of iron and manganese concentrations in sediment relative to SQG and lake-specific AEMP benchmarks may be a natural phenomenon at lakes within the local study area of the mine.

Metal concentrations in sediment of littoral and profundal habitat at Sheardown Lake SE in 2020 were comparable to concentrations observed in the mine baseline period (2005 to 2013), and were also within respective ranges observed in previous years of mine operations (i.e., 2015 to 2019; Figure 4.7; Appendix Table D.32).<sup>14</sup> Thus, no substantial changes to metal concentrations in sediments at Sheardown Lake SE were indicated since the commencement of commercial mine operations in 2015.

#### 4.3.3 Phytoplankton

Chlorophyll-a concentrations at Sheardown Lake SE showed no spatial gradients with closer proximity to the lake outlet during any of the winter, summer, or fall sampling events in 2020 (Figure 4.8). Chlorophyll-a concentrations did not differ significantly between the summer and fall sampling events in 2020, but concentrations in winter were significantly lower than the two open-water seasons (Appendix Table E.6). Similar to Sheardown Lake NW, chlorophyll-a concentrations at Sheardown Lake SE were significantly greater than at the reference lake for both the summer and fall sampling events in 2020 (Appendix Table E.7 and E.8), but concentrations were well below the AEMP benchmark of 3.7 µg/L at all stations and for all sampling events (Figure 4.8). On average, chlorophyll-a concentrations at Sheardown Lake SE

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<sup>14</sup> See footnote 8 regarding differences in the concentration of boron in sediment between baseline and recent CREMP studies.



**Table 4.11: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Sheardown Lake SE (DLO-02), and Reference Lake 3 (REF3) Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter |                 | Units | SQG <sup>a</sup>     | AEMP Benchmark <sup>b</sup><br>(NW, SE) | Littoral                  |                              | Profundal                 |                              |
|-----------|-----------------|-------|----------------------|-----------------------------------------|---------------------------|------------------------------|---------------------------|------------------------------|
|           |                 |       |                      |                                         | Reference Lake<br>(n = 5) | Sheardown Lake SE<br>(n = 3) | Reference Lake<br>(n = 5) | Sheardown Lake SE<br>(n = 2) |
|           |                 |       |                      |                                         | Average ± SD              | Average ± SD                 | Average ± SD              | Average ± SD                 |
| TOC       |                 | %     | 10 <sup>α</sup>      | -                                       | 4.80 ± 1.96               | 1.43 ± 0.828                 | 3.42 ± 1.08               | 1.06 ± 0.332                 |
| Metals    | Aluminum (Al)   | mg/kg | -                    | -                                       | 16,880 ± 1,785            | 17,400 ± 1,114               | 21,800 ± 2,185            | 17,550 ± 1,909               |
|           | Antimony (Sb)   | mg/kg | -                    | -                                       | <0.10 ± 0                 | <0.10 ± 0                    | <0.10 ± 0                 | <0.10 ± 0                    |
|           | Arsenic (As)    | mg/kg | 17                   | 6.2, 5.9                                | 3.53 ± 1.09               | 3.67 ± 0.326                 | 4.07 ± 0.397              | 3.03 ± 0.120                 |
|           | Barium (Ba)     | mg/kg | -                    | -                                       | 117 ± 22.0                | 92 ± 16                      | 122 ± 18.3                | 74 ± 8.2                     |
|           | Beryllium (Be)  | mg/kg | -                    | -                                       | 0.65 ± 0.073              | 0.87 ± 0.079                 | 0.80 ± 0.092              | 0.84 ± 0.078                 |
|           | Bismuth (Bi)    | mg/kg | -                    | -                                       | <0.20 ± 0                 | 0.24 ± 0.031                 | <0.20 ± 0                 | 0.22 ± 0.021                 |
|           | Boron (B)       | mg/kg | -                    | -                                       | 12.2 ± 0.853              | 22.3 ± 3.35                  | 14.7 ± 1.77               | 20.8 ± 2.12                  |
|           | Cadmium (Cd)    | mg/kg | 3.5                  | 1.5, 1.5                                | 0.173 ± 0.047             | 0.102 ± 0.0106               | 0.148 ± 0.0172            | 0.090 ± 0.016                |
|           | Calcium (Ca)    | mg/kg | -                    | -                                       | 5,608 ± 1,247             | 7,663 ± 1,413                | 5,010 ± 407               | 5,990 ± 170                  |
|           | Chromium (Cr)   | mg/kg | 90                   | 97, 79                                  | 54.3 ± 4.40               | <b>79.7</b> ± 9.13           | 65.0 ± 6.64               | 72.3 ± 2.47                  |
|           | Cobalt (Co)     | mg/kg | -                    | -                                       | 10.8 ± 1.64               | 13.7 ± 0.289                 | 15.2 ± 1.56               | 13.3 ± 0.990                 |
|           | Copper (Cu)     | mg/kg | 110                  | 58, 56                                  | 71.4 ± 14.2               | 28.2 ± 2.26                  | <b>83.8</b> ± 11.1        | 26.1 ± 2.62                  |
|           | Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 52,200, 34,400                          | <b>50,600</b> ± 24,939    | <b>42,733</b> ± 6,352        | <b>45,080</b> ± 4,440     | <b>41,950</b> ± 7,000        |
|           | Lead (Pb)       | mg/kg | 91.3                 | 35                                      | 13.8 ± 0.799              | 17.4 ± 1.93                  | 16.7 ± 1.82               | 15.4 ± 1.273                 |
|           | Lithium (Li)    | mg/kg | -                    | -                                       | 26.0 ± 2.51               | 32.6 ± 1.88                  | 33.7 ± 3.83               | 32.2 ± 2.40                  |
|           | Magnesium (Mg)  | mg/kg | -                    | -                                       | 11,440 ± 814              | 15,400 ± 2,095               | 14,180 ± 1,422            | 13,800 ± 1,414               |
|           | Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 4,530, 657                              | 579 ± 258                 | <b>925</b> ± 206             | <b>1,230</b> ± 355        | 602 ± 60.8                   |
|           | Mercury (Hg)    | mg/kg | 0.486                | 0.17                                    | 0.0500 ± 0.0178           | 0.0215 ± 0.00044             | 0.0583 ± 0.0164           | 0.0204 ± 0.0059              |
|           | Molybdenum (Mo) | mg/kg | -                    | -                                       | 4.44 ± 3.31               | 1.50 ± 0.280                 | 2.52 ± 0.273              | 1.40 ± 0.184                 |
|           | Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 77, 66                                  | 40.0 ± 3.52               | 61.3 ± 8.62                  | 45.0 ± 4.54               | 54.2 ± 3.18                  |
|           | Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 1,958, 1,278                            | 1,167 ± 394               | 1,004 ± 55.7                 | 956 ± 47.3                | 929 ± 24.0                   |
|           | Potassium (K)   | mg/kg | -                    | -                                       | 4,100 ± 453               | 4,343 ± 340                  | 5,338 ± 543               | 4,565 ± 728                  |
|           | Selenium (Se)   | mg/kg | -                    | -                                       | 0.73 ± 0.31               | 0.20 ± 0.01                  | 0.61 ± 0.18               | 0.21 ± 0.0071                |
|           | Silver (Ag)     | mg/kg | -                    | -                                       | 0.14 ± 0.047              | 0.12 ± 0.006                 | 0.20 ± 0.057              | 0.12 ± 0.0141                |
|           | Sodium (Na)     | mg/kg | -                    | -                                       | 304.2 ± 32                | 279 ± 31                     | 369 ± 50                  | 261 ± 13.4                   |
|           | Strontium (Sr)  | mg/kg | -                    | -                                       | 11.6 ± 1.70               | 11.7 ± 1.277                 | 12.3 ± 1.24               | 10.7 ± 0.778                 |
|           | Sulphur (S)     | mg/kg | -                    | -                                       | 1,400 ± 387               | <1,000 ± 0                   | 1,140 ± 195               | <1,000 ± 0                   |
|           | Thallium (Tl)   | mg/kg | -                    | -                                       | 0.379 ± 0.0415            | 0.415 ± 0.0598               | 0.594 ± 0.094             | 0.364 ± 0.0361               |
|           | Tin (Sn)        | mg/kg | -                    | -                                       | <2.0 ± 0                  | <2.0 ± 0                     | <2.0 ± 0                  | <2.0 ± 0                     |
|           | Titanium (Ti)   | mg/kg | -                    | -                                       | 1,006 ± 109               | 1,303 ± 85                   | 1,136 ± 50                | 1,290 ± 0.0                  |
|           | Uranium (U)     | mg/kg | -                    | -                                       | 11.0 ± 2.41               | 5.03 ± 0.431                 | 19.7 ± 3.76               | 4.86 ± 0.658                 |
|           | Vanadium (V)    | mg/kg | -                    | -                                       | 54.1 ± 5.40               | 51.0 ± 3.97                  | 63.4 ± 4.89               | 48.3 ± 1.63                  |
|           | Zinc (Zn)       | mg/kg | 315                  | 135                                     | 73.1 ± 7.83               | 57.3 ± 1.85                  | 83.8 ± 8.52               | 54.8 ± 6.43                  |
|           | Zirconium (Zr)  | mg/kg | -                    | -                                       | 4.5 ± 1.0                 | 17.6 ± 1.8                   | 3.9 ± 0.32                | 17.9 ± 1.8                   |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD** Indicates parameter concentration above the AEMP Benchmark.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to the Sheardown Lake basins



indicated an 'oligotrophic' status as defined by Wetzel (2001). This trophic status classification was consistent with an oligotrophic categorization for Sheardown Lake SE based on CWQG (CCME 2020) trophic classifications as defined by total phosphorus concentrations (i.e., average concentrations below 10 µg/L; Table 4.10; Appendix Table C.54).

Chlorophyll-a concentrations did not indicate any consistent direction of significant differences between 2020 and the mine construction (2014) period or previous years of mine operation (2015 to 2019) for winter, summer, and fall seasons (Figure 4.14; Appendix Table E.13). The variability in chlorophyll-a concentrations among years at Sheardown Lake SE may reflect the combination of mine-related influences and variable influence of Mary River on Sheardown Lake SE water levels, hydraulic retention time, and/or chemistry among years/seasons. For instance, Mary River discharges into or drains Sheardown Lake SE during high and low flow periods, respectively, the nature of which may affect phytoplankton abundance and/or community structure. No chlorophyll-a baseline (2005 to 2013) data are available for Sheardown Lake SE, precluding comparisons to conditions prior to the mine construction period.

#### 4.3.4 Benthic Invertebrate Community

Benthic invertebrate density was significantly higher at littoral and profundal habitats, and richness was significantly higher at profundal habitat, of Sheardown Lake SE compared to like-habitat stations at Reference Lake 3, the differences of which were at magnitudes outside of the  $CES_{BIC}$  of  $\pm 2 SD_{REF}$  (Tables 4.12 and 4.13). In addition to these differences, benthic invertebrate community compositional differences were indicated between Sheardown Lake SE and Reference Lake 3 based on significantly differing Bray-Curtis Index for both littoral and profundal habitat types (Appendix Table F.21). However, the only ecologically significant differences in dominant taxonomic groups included higher and lower relative abundance of Chironomidae and Ostracoda, respectively, at littoral stations of Sheardown Lake SE compared to Reference Lake 3 (Table 4.12). No differences in dominant taxonomic groups were indicated between Sheardown Lake SE and the reference lake in 2020 (Tables 4.12 and 4.13). Similar to Sheardown Lake NW, the occurrence of higher benthic invertebrate density without an accompanying difference in evenness or existence of a significantly lower relative abundance of metal-sensitive taxa suggested that Sheardown Lake SE was simply more productive than Reference Lake 3, and was not adversely influenced by mine operations in 2020.

Similar to the other mine-exposed lakes, sediment at littoral and profundal stations of Sheardown Lake SE was significantly more compact (i.e., lower moisture content) than like-habitat stations at the reference lake (Appendix Table F.39). The occurrence of more stable, compact sediment likely accounted for an ecologically significant higher relative abundance of the burrower HPG at Sheardown Lake SE compared to the reference lake (Tables 4.12 and 4.13). In addition to





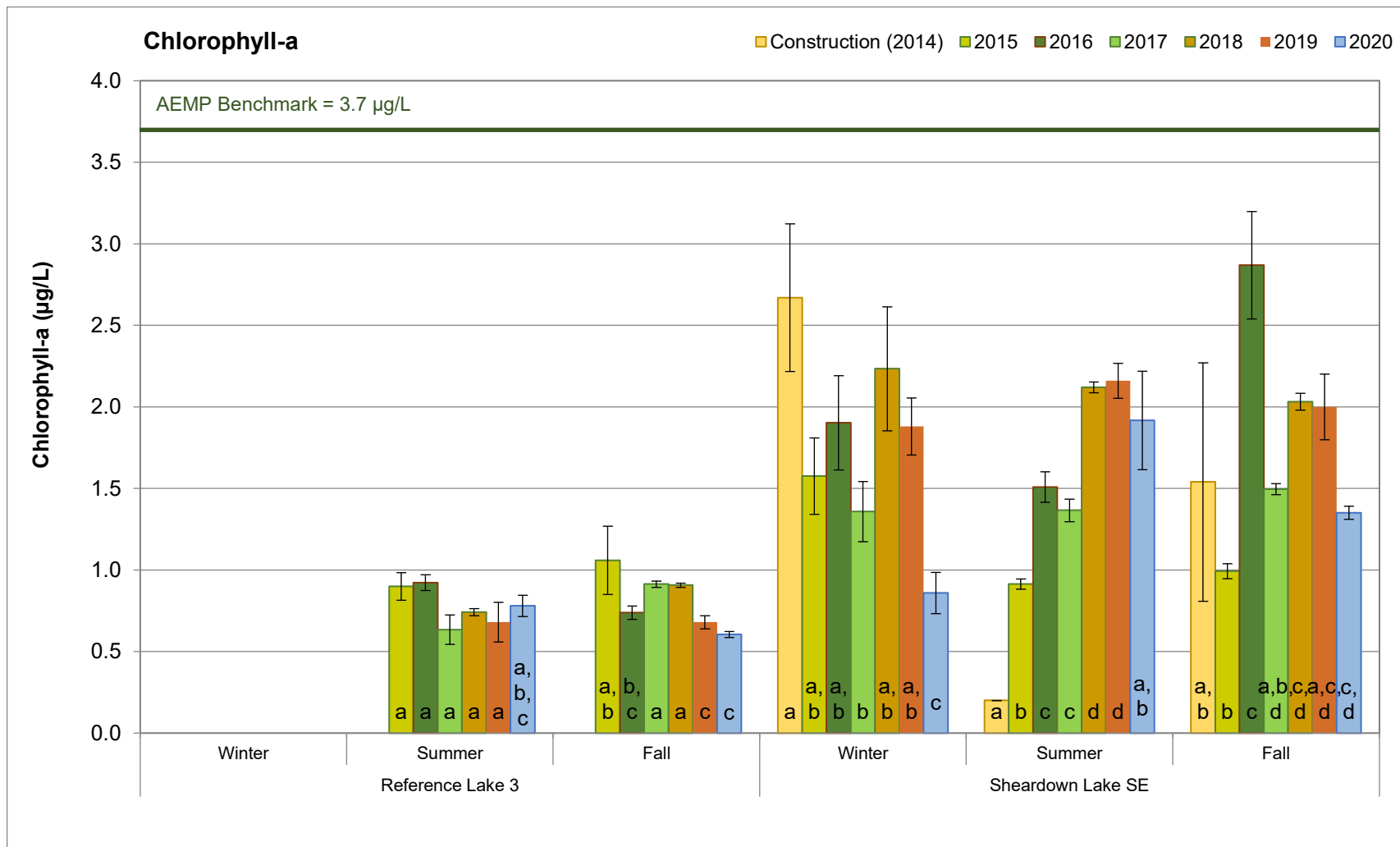


**Figure 4.14: Temporal Comparison of Chlorophyll-a Concentrations Among Seasons between Sheardown Lake SE and Reference Lake 3 for Mine Construction (2014) and Operational (2015 to 2020) Periods (mean ± SE)**

Note: Bars with the same letter at the base do not differ significantly between years for the applicable season.

**Table 4.12: Benthic Invertebrate Community Statistical Comparison Results between Sheardown Lake SE (DLO-02) and Reference Lake 3 for Littoral Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics          |                |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|-----------------------------|----------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Littoral Habitat | Mean ( n = 5 ) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | < 0.001 | 8.9                                              | Reference Lake 3            | 1,571          | 430                | 193            | 1,190   | 1,474  | 2,310   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 5,407          | 1,391              | 622            | 3,216   | 5,509  | 6,914   |
| Richness (Number of Taxa)             | t-equal                  | log10               | NO                                    | 0.305   | -1.0                                             | Reference Lake 3            | 14.6           | 2.5                | 1.1            | 13.0    | 14.0   | 19.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 12.2           | 1.6                | 0.7            | 10.0    | 13.0   | 14.0    |
| Simpson's Evenness (E )               | t-equal                  | none                | NO                                    | 0.799   | 0.1                                              | Reference Lake 3            | 0.810          | 0.110              | 0.049          | 0.630   | 0.847  | 0.923   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 0.826          | 0.068              | 0.031          | 0.722   | 0.827  | 0.911   |
| Shannon Diversity                     | t-equal                  | log10               | NO                                    | 0.547   | -0.4                                             | Reference Lake 3            | 2.710          | 0.526              | 0.235          | 2.080   | 2.730  | 3.510   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 2.520          | 0.261              | 0.117          | 2.220   | 2.570  | 2.830   |
| Hydracarina (%)                       | t-equal                  | log10               | NO                                    | 0.167   | -0.7                                             | Reference Lake 3            | 5.3            | 2.6                | 1.2            | 3.5     | 4.4    | 9.9     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 3.4            | 2.4                | 1.1            | 1.0     | 2.7    | 5.9     |
| Ostracoda (%)                         | t-equal                  | log10               | YES                                   | < 0.001 | -2.1                                             | Reference Lake 3            | 37.9           | 14.5               | 6.5            | 26.7    | 36.2   | 62.6    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 6.8            | 3.5                | 1.6            | 2.3     | 8.1    | 10.3    |
| Chironomidae (%)                      | t-equal                  | none                | YES                                   | 0.001   | 2.3                                              | Reference Lake 3            | 52.6           | 15.6               | 7.0            | 26.9    | 59.0   | 66.4    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 89.2           | 5.1                | 2.3            | 81.9    | 89.0   | 96.4    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | YES                                   | 0.012   | -1.7                                             | Reference Lake 3            | 28.8           | 9.5                | 4.3            | 15.6    | 32.5   | 38.7    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 12.3           | 6.5                | 2.9            | 3.0     | 15.1   | 19.5    |
| Collector-Gatherers (%)               | t-equal                  | log10               | NO                                    | 0.258   | -0.8                                             | Reference Lake 3            | 63.1           | 11.4               | 5.1            | 53.6    | 60.3   | 81.5    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 54.0           | 14.9               | 6.7            | 40.3    | 50.6   | 75.3    |
| Filterers (%)                         | t-equal                  | none                | YES                                   | 0.022   | -1.5                                             | Reference Lake 3            | 27.1           | 9.8                | 4.4            | 14.4    | 29.2   | 38.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 12.3           | 6.5                | 2.9            | 3.0     | 15.1   | 19.5    |
| Shredders (%)                         | t-unequal                | none                | YES                                   | 0.060   | -1.2                                             | Reference Lake 3            | 3.9            | 3.3                | 1.5            | 0.6     | 3.2    | 7.4     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 0.0            | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
| Clingers (%)                          | t-equal                  | none                | YES                                   | 0.011   | -1.8                                             | Reference Lake 3            | 31.9           | 9.3                | 4.2            | 17.9    | 33.5   | 41.6    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 15.5           | 6.4                | 2.9            | 4.7     | 18.1   | 20.9    |
| Sprawlers (%)                         | t-equal                  | log10               | NO                                    | 0.267   | -0.7                                             | Reference Lake 3            | 57.9           | 12.1               | 5.4            | 41.0    | 57.2   | 73.8    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 49.7           | 9.0                | 4.0            | 42.4    | 46.5   | 65.3    |
| Burrowers (%)                         | t-equal                  | none                | YES                                   | 0.004   | 5.0                                              | Reference Lake 3            | 10.2           | 4.9                | 2.2            | 4.6     | 8.3    | 17.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Littoral       | 34.8           | 13.1               | 5.9            | 16.6    | 35.1   | 52.9    |

Grey shading indicates statistically significant difference between study areas based on p-value less than 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a CES of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

**Table 4.13: Benthic Invertebrate Community Statistical Comparison Results between Sheardown Lake SE (DLO-02) and Reference Lake 3 for Profundal Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics           |                |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|------------------------------|----------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Profundal Habitat | Mean ( n = 5 ) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | < 0.001 | 23.9                                             | Reference Lake 3             | 479            | 142                | 63             | 336     | 491    | 681     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 3,869          | 1,304              | 583            | 3,026   | 3,336  | 6,164   |
| Richness (Number of Taxa)             | t-equal                  | none                | YES                                   | 0.034   | 2.4                                              | Reference Lake 3             | 7.0            | 1.9                | 0.8            | 5.0     | 8.0    | 9.0     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 11.4           | 3.4                | 1.5            | 6.0     | 12.0   | 15.0    |
| Simpson's Evenness (E )               | t-equal                  | none                | NO                                    | 0.429   | 0.9                                              | Reference Lake 3             | 0.731          | 0.045              | 0.020          | 0.689   | 0.721  | 0.795   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 0.772          | 0.099              | 0.045          | 0.619   | 0.806  | 0.869   |
| Shannon Diversity                     | t-equal                  | none                | NO                                    | 0.101   | 2.3                                              | Reference Lake 3             | 1.800          | 0.196              | 0.088          | 1.580   | 1.720  | 2.030   |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 2.250          | 0.501              | 0.224          | 1.670   | 2.570  | 2.670   |
| Hydracarina (%)                       | t-equal                  | none                | NO                                    | 0.434   | -0.4                                             | Reference Lake 3             | 2.8            | 2.0                | 0.9            | 0.0     | 3.5    | 5.1     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 1.9            | 1.3                | 0.6            | 0.3     | 2.5    | 3.1     |
| Ostracoda (%)                         | t-equal                  | log10               | NO                                    | 0.177   | -0.8                                             | Reference Lake 3             | 8.6            | 4.1                | 1.8            | 3.5     | 7.7    | 14.5    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 5.3            | 5.1                | 2.3            | 0.5     | 5.7    | 13.0    |
| Chironomidae (%)                      | t-equal                  | none                | NO                                    | 0.202   | 1.1                                              | Reference Lake 3             | 87.9           | 4.2                | 1.9            | 82.3    | 87.2   | 92.7    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 92.5           | 6.2                | 2.8            | 84.1    | 91.2   | 98.9    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | NO                                    | 0.191   | -0.7                                             | Reference Lake 3             | 31.5           | 17.6               | 7.9            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 19.9           | 4.7                | 2.1            | 11.8    | 21.6   | 24.0    |
| Collector-Gatherers (%)               | t-equal                  | log10               | NO                                    | 0.292   | -0.7                                             | Reference Lake 3             | 62.9           | 15.0               | 6.7            | 45.4    | 56.1   | 79.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 52.5           | 14.5               | 6.5            | 33.6    | 52.1   | 70.6    |
| Filterers (%)                         | t-equal                  | none                | NO                                    | 0.212   | -0.6                                             | Reference Lake 3             | 30.7           | 17.5               | 7.8            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 19.7           | 4.7                | 2.1            | 11.8    | 21.6   | 23.8    |
| Clingers (%)                          | t-equal                  | none                | NO                                    | 0.142   | -0.8                                             | Reference Lake 3             | 33.5           | 16.9               | 7.6            | 13.1    | 41.5   | 52.8    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 20.5           | 5.3                | 2.4            | 12.3    | 21.7   | 26.9    |
| Sprawlers (%)                         | t-equal                  | log10               | YES                                   | 0.041   | -1.7                                             | Reference Lake 3             | 64.8           | 16.2               | 7.2            | 45.5    | 58.5   | 87.0    |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 36.9           | 17.8               | 8.0            | 16.8    | 37.4   | 55.1    |
| Burrowers (%)                         | t-unequal                | log10(x+1)          | YES                                   | 0.007   | 14.2                                             | Reference Lake 3             | 1.7            | 2.9                | 1.3            | 0.0     | 0.0    | 6.7     |
|                                       |                          |                     |                                       |         |                                                  | Sheardown SE Profundal       | 42.6           | 21.3               | 9.5            | 19.4    | 43.0   | 66.3    |

Grey shading indicates statistically significant difference between study areas based on p-value less than 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a CES of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

differences in sediment properties between lakes, significantly shallower ‘profundal’ sampling depths at Sheardown Lake SE likely contributed to the differences in benthic invertebrate community features compared to the reference lake (Appendix Table F.39). Natural depth-related influences on benthic invertebrate community structure that include lower density and richness at greater depth in lake environments are well documented (Ward 1992; Armitage et al. 1995), and were consistently evident at Reference Lake 3 from 2015 to 2020 (Appendix B) indicating similar patterns in pristine lakes of the Mary River Project region. The maximum depth of Sheardown Lake SE is approximately 14 m (Minnow 2018). Because profundal habitat for the Mary River Project CREMP is defined as water depths  $\geq 12$  m, benthic invertebrate community data collected from profundal depths of Sheardown Lake SE (average station depth of 12 m) are not directly comparable to those at Reference Lake 3, where the mean depth of profundal stations is 21 m (Appendix Table F.39). Therefore, the differences in benthic invertebrate community endpoints shown between Sheardown Lake SE and the reference lake in 2020 likely reflected a combination of naturally greater productivity, naturally more compact sediment, and naturally shallower ‘profundal’ sampling depths at Sheardown Lake SE. Moreover, no ecologically significant effects on the relative abundance of metal-sensitive Chironomidae were indicated at Sheardown Lake SE in 2020, suggesting no metal-related influences on the benthic invertebrate community of the lake.

Benthic invertebrate density was routinely significantly lower at Sheardown Lake SE in years of mine operation compared to baseline (Appendix Tables F.41 and F.42). However, no ecologically significant differences in richness, evenness, relative abundance of dominant taxonomic groups, or relative abundance of HPG were consistently shown at littoral or profundal habitat of Sheardown Lake SE over the 2015 to 2020 period of mine operation compared to baseline (Appendix Figures F.12 and F.13; Appendix Tables F.41 and F.42). Because density was the only benthic invertebrate community metric that consistently differed between the mine-operational and baseline period, natural temporal variability among studies (and in particular, high density during the 2007 and 2013 baseline studies) likely accounted for the difference in benthic invertebrate density at Sheardown Lake SE between these periods. Overall, consistent with no substantial differences in water and sediment quality since the mine baseline period, no ecologically significant differences in benthic invertebrate community features were indicated at littoral and profundal habitat of Sheardown Lake SE following the commencement of mine operation in 2015.



#### 4.3.5 Fish Population

##### 4.3.5.1 Sheardown Lake SE Fish Community

The Sheardown Lake SE fish community was composed of arctic charr and ninespine stickleback in 2020 (Table 4.8), the same fish species as observed in previous years (Minnow 2020). Total fish CPUE was greater at Sheardown Lake SE than Reference Lake 3, suggesting higher densities and/or productivity of both arctic charr and ninespine stickleback at Sheardown Lake SE (Table 4.8). Consistent with the other mine-exposed lakes, greater numbers of arctic charr, together with greater density of benthic invertebrates, suggested that productivity was higher at Sheardown Lake SE than at Reference Lake 3. Electrofishing and gill netting CPUE at Sheardown Lake SE in 2020 were both within respective ranges observed during the previous five years of mine operation (i.e., 2015 to 2019), and were generally greater than in baseline studies (i.e., 2006 through 2008; Figure 4.10). Based on these data, arctic charr abundance at nearshore and littoral/profundal habitats may be comparable to, or potentially greater than, baseline at Sheardown Lake SE indicating that the mine has not adversely influenced the number of arctic charr in the lake.

##### 4.3.5.2 Sheardown Lake SE Fish Population Assessment

###### Nearshore Arctic Charr

A total of 100 arctic charr were captured from nearshore habitat at each of Sheardown Lake SE and Reference Lake 3 in August 2020. Arctic charr YOY were distinguished from non-YOY using fork length cut-offs of 5.1 cm and 4.3 cm for the Sheardown Lake SE and Reference Lake 3 data sets, respectively, based on evaluation of length-frequency distributions coupled with supporting age determinations (Figure 4.15; Appendix Tables G.4 and G.19). Because greater than ten YOY arctic charr were identified from the Sheardown Lake SE and Reference Lake 3 populations, statistical comparisons of health endpoints were completed separately on both the YOY and non-YOY populations. The length-frequency distribution for the whole population of nearshore arctic charr did not differ significantly between Sheardown Lake SE and Reference Lake 3; however, a difference was noted when comparing non-YOY between the two lakes (Appendix Table G.20). This difference reflected slightly larger non-YOY fish captured at Sheardown Lake SE compared to the reference lake (Figure 4.15). Arctic charr YOY and non-YOY from nearshore areas of Sheardown Lake SE were significantly larger and had greater condition than those from Reference Lake 3 (Table 4.14; Appendix Table G.20). The absolute magnitudes of difference in condition were greater than the  $CES_c$  of 10% for both age classes at Sheardown Lake SE, suggesting that the differences may be ecologically significant (Table 4.14; Appendix Table G.20).



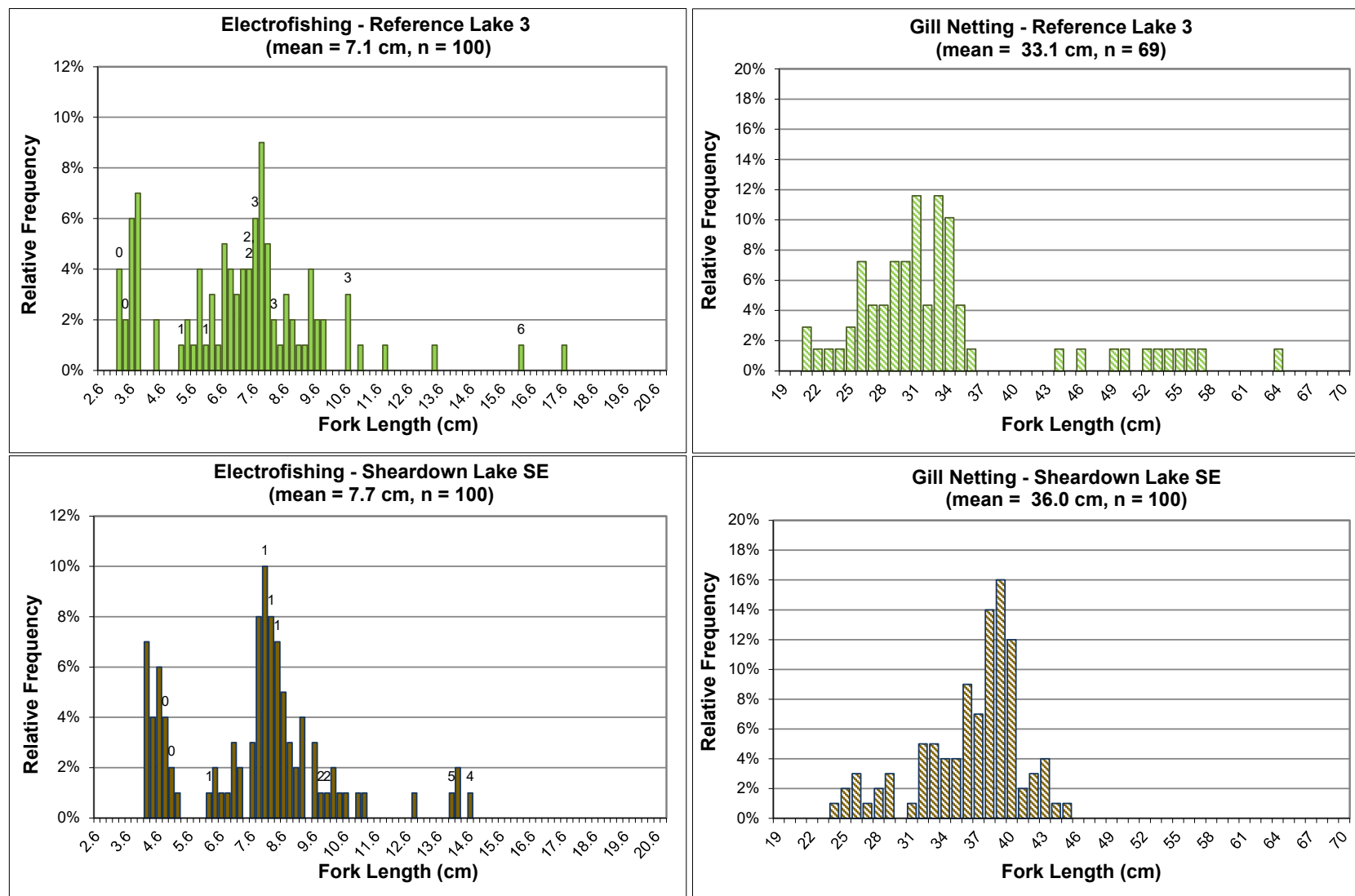


**Figure 4.15:** Length-Frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Sheardown Lake SE (DLO-02) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020

Note: Fish ages are shown above the bars, where available.

**Table 4.14: Summary of Statistical Results for Arctic Charr Population Comparisons between Sheardown Lake SE and Reference Lake 3 from 2015 to 2020, and between Sheardown Lake SE Mine Operational and Baseline Period Data, for Fish Captured by Electrofishing and Gill Netting Methods, Mary River Project CREMP**

| Data Set by Sampling Method                  | Response Category        | Endpoint                               | Statistically Significant Differences Observed? <sup>a</sup> |      |            |            |             |             |                                                            |            |            |            |            |             |
|----------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------------------------|------|------------|------------|-------------|-------------|------------------------------------------------------------|------------|------------|------------|------------|-------------|
|                                              |                          |                                        | versus Reference Lake 3                                      |      |            |            |             |             | versus Sheardown Lake SE baseline period data <sup>b</sup> |            |            |            |            |             |
|                                              |                          |                                        | 2015                                                         | 2016 | 2017       | 2018       | 2019        | 2020        | 2015                                                       | 2016       | 2017       | 2018       | 2019       | 2020        |
| Nearshore Electrofishing                     | Survival                 | Length-Frequency Distribution          | No                                                           | Yes  | Yes        | Yes        | Yes         | Yes         | Yes                                                        | Yes        | Yes        | Yes        | Yes        | Yes         |
|                                              |                          | Age                                    | No                                                           | No   | No         | -          | -           | -           | Yes (+273%)                                                | -          | -          | -          | -          | -           |
|                                              | Energy Use (non-YOY)     | Size (mean fork length)                | No                                                           | No   | Yes (+12%) | Yes (+21%) | Yes (-28%)  | Yes (+7%)   | Yes (+7%)                                                  | Yes (-15%) | Yes (+19%) | Yes (-47%) | No         | Yes (+30%)  |
|                                              |                          | Size (mean weight)                     | No                                                           | No   | Yes (+55%) | Yes (+59%) | Yes (-59%)  | Yes (+53%)  | No                                                         | Yes (-43%) | Yes (+54%) | No         | No         | Yes (+117%) |
|                                              | Energy Storage (non-YOY) | Condition (body weight-at-fork length) | Yes (+4%)                                                    | No   | Yes (+9%)  | Yes (-13%) | Yes (+4%)   | Yes (+14%)  | Yes (-14%)                                                 | Yes (-16%) | No         | Yes (-15%) | Yes (-13%) | No          |
| Littoral/Profundal Gill Netting <sup>c</sup> | Survival                 | Length Frequency Distribution          | -                                                            | -    | -          | Yes        | Yes         | Yes         | Yes                                                        | Yes        | Yes        | Yes        | No         | No          |
|                                              |                          | Age                                    | -                                                            | -    | -          | -          | -           | -           | Yes (-13%)                                                 | No         | No         | -          | -          | -           |
|                                              | Energy Use               | Size (mean fork length)                | -                                                            | -    | -          | No         | Yes (+23%)  | Yes (+21%)  | Yes (-9%)                                                  | Yes (-7%)  | Yes (-5%)  | Yes (-4%)  | Yes (-2%)  | No          |
|                                              |                          | Size (mean weight)                     | -                                                            | -    | -          | No         | Yes (+102%) | Yes (+107%) | Yes (-26%)                                                 | Yes (-20%) | Yes (-16%) | Yes (-16%) | Yes (-11%) | Yes (-7.0%) |
|                                              |                          | Growth (fork length-at-age)            | -                                                            | -    | -          | -          | -           | -           | No                                                         | No         | No         | -          | -          | -           |
|                                              |                          | Growth (weight-at-age)                 | -                                                            | -    | -          | -          | -           | -           | Yes (+18%)                                                 | Yes (+24%) | No         | -          | -          | -           |
|                                              | Energy Storage           | Condition (body weight-at-fork length) | -                                                            | -    | -          | Yes (+7%)  | No          | Yes (+14%)  | No                                                         | No         | Yes (-6%)  | Yes (-7%)  | Yes (-6%)  | Yes (-5.0%) |

**BOLD** indicates a significant difference related to the comparison.

<sup>a</sup> Values in parentheses indicate direction and magnitude of any significant differences.

<sup>b</sup> Baseline period data included 2007 nearshore electrofishing data and 2007 and 2008 littoral/profundal gill netting data.

<sup>c</sup> Due to low catches of arctic charr in gill nets at Reference Lake 3 in 2015, 2016, and 2017, no comparison of fish health was conducted for gill netted fish.



No consistent directional differences in size or condition were observed in non-YOY arctic charr from nearshore habitat of Sheardown Lake SE compared to the reference lake from 2015 to 2020, although most often larger fish of slightly greater condition occurred at Sheardown Lake SE over this period (Table 4.14). Although before-after analysis of data collected at Sheardown Lake SE in 2020 (mine operation) and 2007 (baseline) was conducted (Appendix Table G.7), poor accuracy in fresh body weight measurements during baseline sampling precluded meaningful data interpretation, and therefore these results were not discussed herein. Overall, the differences in nearshore non-YOY arctic charr size and condition between Sheardown Lake SE and Reference Lake 3 likely reflected natural variability between the two populations over time.

### **Littoral/Profundal Arctic Charr**

A total of 100 and 69 arctic charr were sampled from littoral/profundal habitat of Sheardown Lake SE and Reference Lake 3, respectively, in August 2020. The length-frequency distribution for littoral/profundal arctic charr differed significantly between lakes due to more larger fish being captured at Sheardown Lake SE (Table 4.14; Figure 4.15). Littoral/profundal arctic charr from Sheardown Lake SE were significantly longer, heavier, and had greater condition than those from Reference Lake 3 (Table 4.14; Appendix Table G.24). The absolute magnitude of difference in condition was also above the  $CES_C$  of 10%, suggesting potential ecological significance (Table 4.14; Appendix Table G.20).

The differences in size and condition of arctic charr captured from littoral/profundal habitat between Sheardown Lake NW and Reference Lake 3 in 2020 were similar to the differences shown in 2018 and/or 2019, suggesting no appreciable changes in health of littoral/profundal arctic charr at Sheardown Lake NW over time. No difference in length-frequency distribution of arctic charr captured from littoral/profundal habitat of Sheardown Lake SE was shown between 2020 and baseline, although differences were reported historically (Table 4.14). Arctic charr sampled from littoral/profundal habitat of Sheardown Lake SE in years of mine operation (i.e., 2015 to 2020) have almost consistently been smaller than those captured at the time of the mine baseline, but significantly lower condition has only occurred compared to baseline since 2017 (Table 4.14). Differences in arctic charr condition from 2015 to 2020 at Sheardown Lake SE, relative to Reference Lake 3 or Sheardown Lake SE baseline, were generally absent or not ecologically meaningful based on the magnitude of difference being within the  $CES_C$  of  $\pm 10\%$  (Table 4.14). In turn, this suggested no adverse influences on adult arctic charr at Sheardown Lake SE through the first six years of mine operation.



#### 4.3.6 Effects Assessment and Recommendations

At Sheardown Lake SE, the following AEMP benchmarks were exceeded in 2020:

- Chromium concentration in sediment, on average, was greater than the benchmark of 79 mg/kg at littoral stations;
- Iron concentration in sediment, on average, was greater than the benchmark of 34,400 mg/kg at littoral and profundal stations;
- Manganese concentration in sediment was, on average, greater than the benchmark of 657 mg/kg at littoral stations; and,
- Nickel concentration in sediment was greater than the benchmark of 66 mg/kg at one littoral monitoring station (DL0-02-11), although the average concentration of nickel in sediment at littoral stations was below this benchmark.

No AEMP benchmarks for water quality were exceeded over the duration of spring, summer, and fall sampling events in 2020 at Sheardown Lake SE. Lake-specific AEMP benchmarks for sediment quality were exceeded for chromium, iron, manganese, and nickel concentrations at Sheardown Lake SE in 2020. However, none of these metals occurred at concentrations in sediment of Sheardown Lake SE that were elevated compared to the reference lake, or to concentrations shown at Sheardown Lake SE during the baseline period. In addition, concentrations of these metals were above the Sheardown Lake SE AEMP benchmarks in sediment at the reference lake, suggesting naturally high concentrations of each of the indicated metals in sediments of area lakes. Notably, AEMP benchmarks established for sediment quality at Sheardown Lake SE tend to be lower than SQG, and are generally lower than AEMP benchmarks established for the other mine-exposed lakes (Baffinland 2015). No adverse effects to phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at Sheardown Lake SE in 2020 based on comparisons to reference conditions and to applicable Sheardown Lake SE baseline conditions. Because no mine-related changes in metal concentrations occurred in sediment at Sheardown Lake SE in 2020 and no adverse effects to biota were associated with concentrations of metals above AEMP benchmarks for sediment quality, a low action response is recommended to meet obligations under the AEMP Management Response Framework. Specifically, it is recommended that the relevance of site-specific sediment quality AEMP benchmarks for Sheardown Lake SE be assessed and, if necessary, determined anew taking into consideration data from the reference lake and applicable SQG.



## 5 MARY RIVER AND MARY LAKE SYSTEM

### 5.1 Mary River Tributary-F

#### 5.1.1 Water Quality

Mary River Tributary-F (MRTF) dissolved oxygen concentrations did not differ significantly between areas located downstream and upstream of the MS-08 effluent discharge channel (effluent-exposed and reference areas, respectively) and were well above the WQG lowest acceptable concentration for sensitive early life stages of cold-water biota (i.e., 9.5 mg/L) at both areas at the time of EEM sampling (i.e., August 2020). Although pH and specific conductance were each significantly higher at the effluent-exposed area than at the reference area of MRTF, the mean incremental difference between areas for each of these parameters was very small and pH values were well within the WQG acceptable range for the protection of aquatic life (i.e., between 6.5 and 9.0) at the time of EEM sampling. The proportion of effluent within MRTF immediately below the effluent channel confluence was estimated as 2.6% on average, under flow conditions at the time of EEM sampling, based on extrapolation using measures of specific conductance collected in the field (Minnow 2021).

Water chemistry at MRTF met all AEMP benchmarks over the duration of spring, summer, and fall sampling events in 2020 (Table 5.1). Although concentrations of total aluminum and phosphorus were above applicable WQG in spring at the effluent-exposed area of MRTF (i.e., Station F0-01), concentrations of these parameters were also above WQG at reference areas indicating naturally elevated concentrations of aluminum and phosphorus within regional watercourses (Table 5.1). Among those parameters with established AEMP benchmarks, nitrate and sulphate concentrations were consistently elevated at MRTF compared to the Mary River reference area (i.e., G0-09 series stations) in all spring, summer, and fall sampling events (Appendix Tables C.59 and C.61), but remained at concentrations well below AEMP benchmarks and WQG (Table 5.1). Nitrate and sulphate concentrations were also elevated in summer and fall sampling events from 2018 to 2020 compared to baseline at MRTF (Appendix Figure C.23). No other parameters were observed at concentrations that were continually elevated at MRTF in 2020 compared to reference conditions through all seasons, nor compared to baseline, except that total and dissolved concentrations of manganese were elevated compared to reference conditions during the spring sampling event in 2020 (Appendix Tables C.59 and C.61; Appendix Figure C.23). Overall, a slight mine-related influence on water quality was indicated by elevated concentrations of nitrate and sulphate at MRTF in 2020, but concentrations of these parameters (and all others) were routinely well below AEMP benchmarks and WQG since commercial mine operations commenced in 2015.



Table 5.1: Mean Water Chemistry at Mary River Monitoring Stations During Spring, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | G0-09 Reference (n = 3) |          |          | G0 Upstream (n = 2) |            |          | Mary River Tributary F |            |            | E0 Adjacent (n = 4) |          |          | C0 Downstream (n = 3) |          |          |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-------------------------|----------|----------|---------------------|------------|----------|------------------------|------------|------------|---------------------|----------|----------|-----------------------|----------|----------|
|                        |                                    |         |                                            |                             | Spring                  | Summer   | Fall     | Spring              | Summer     | Fall     | Spring                 | Summer     | Fall       | Spring              | Summer   | Fall     | Spring                | Summer   | Fall     |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 61                      | 186      | 248      | 45                  | 171        | 228      | 108                    | 345        | 403        | 53                  | 178      | 245      | 57                    | 176      | 234      |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.74                    | 8.22     | 8.33     | 7.64                | 8.14       | 8.48     | 7.89                   | 8.30       | 8.32       | 7.67                | 8.17     | 8.19     | 7.66                  | 8.22     | 8.17     |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 28                      | 81       | 120      | 20                  | 74         | 106      | 49.9                   | 166        | 211        | 24                  | 77       | 117      | 25                    | 75       | 112      |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2                       | 12.6     | 2.1      | 14.6                | 10.25      | 2.8      | 9.8                    | <2.0       | <2.0       | 8.5                 | 12.5     | 2.5      | 7.7                   | 15.1     | 2.0      |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 66                      | 97       | 129      | 66                  | 103        | 119      | 90                     | 190        | 224        | 74                  | 116      | 128      | 73                    | 107      | 127      |
|                        | Turbidity                          | NTU     | -                                          | -                           | 4.3                     | 26.3     | 2.8      | 7.3                 | 34.5       | 4.7      | 2.2                    | 0.4        | 0.6        | 6.3                 | 38.6     | 6.2      | 8.5                   | 29.5     | 3.3      |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 29                      | 80       | 103      | 21                  | 78         | 91       | 39                     | 122        | 132        | 27                  | 83       | 95       | 24                    | 82       | 94       |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.010                   | 0.010    | 0.01     | 0.01                | 0.01       | 0.01     | <0.010                 | <0.010     | <0.010     | 0.010               | 0.010    | 0.010    | 0.010                 | 0.010    | 0.011    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.021                   | 0.147    | 0.103    | 0.030               | 0.101      | 0.163    | 0.187                  | 0.714      | 1.090      | 0.043               | 0.133    | 0.259    | 0.089                 | 0.171    | 0.229    |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                   | 0.005    | 0.005    | 0.005               | 0.005      | 0.005    | <0.0050                | <0.0050    | <0.0050    | 0.005               | 0.005    | 0.005    | 0.005                 | 0.005    | 0.005    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.15                    | 0.15     | 0.15     | 0.15                | 0.15       | 0.15     | <0.15                  | 0.32       | 0.16       | 0.15                | 0.15     | 0.17     | 0.15                  | 0.15     | 0.15     |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.6                     | 4.0      | 2.6      | 2.3                 | 4.0        | 2.3      | 2.1                    | 1.7        | 2.0        | 2.2                 | 3.0      | 2.2      | 2.2                   | 2.6      | 2.3      |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.2                     | 2.9      | 2.4      | 2.7                 | 2.8        | 2.3      | 2.9                    | 2.7        | 2.3        | 2.9                 | 3.2      | 2.3      | 3.3                   | 3.3      | 2.6      |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>α</sup>                         | -                           | 0.0121                  | 0.0215   | 0.0034   | 0.0557              | 0.0225     | 0.0038   | 0.0377                 | <0.0030    | <0.0030    | 0.0480              | 0.0240   | 0.0046   | 0.0365                | 0.0230   | 0.0073   |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | 0.0015                  | 0.0012   | 0.0010   | 0.0010              | 0.0010     | 0.0010   | <0.0010                | <0.0010    | <0.0010    | 0.0012              | 0.0010   | 0.0010   | 0.0011                | 0.0010   | 0.0010   |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | 0.1                     | 0.1      | 0.1      | 0.1                 | 0.1        | 0.1      | <0.10                  | <0.10      | <0.10      | 0.1                 | 0.1      | 0.1      | 0.1                   | 0.1      | 0.1      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.0                     | 8.9      | 11.8     | 1.6                 | 7.8        | 13.2     | 1.3                    | 13.7       | 11.7       | 1.1                 | 7.6      | 12.7     | 1.4                   | 7.5      | 11.7     |
| Total Metals           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 0.7                     | 5.5      | 6.7      | 0.6                 | 4.9        | 7.0      | 11.8                   | 36.0       | 60.7       | 2.9                 | 6.4      | 12.1     | 2.6                   | 6.1      | 10.4     |
|                        | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.966                       | 0.121                   | 1.046    | 0.087    | 0.230               | 1.330      | 0.148    | 0.170                  | 0.034      | 0.041      | 0.216               | 1.071    | 0.173    | 0.204                 | 1.202    | 0.121    |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | 0.0001                  | 0.0001   | 0.0001   | 0.0001              | 0.0001     | 0.0001   | <0.00010               | <0.00010   | <0.00010   | 0.0001              | 0.0001   | 0.0001   | 0.0001                | 0.0001   | 0.0001   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.00011                 | 0.00021  | 0.0001   | 0.000115            | 0.000245   | 0.00010  | <0.00010               | <0.00010   | <0.00010   | 0.00010             | 0.00022  | 0.00010  | 0.00010               | 0.00023  | 0.00010  |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0049                  | 0.0159   | 0.0140   | 0.0052              | 0.0178     | 0.0148   | 0.0054                 | 0.0165     | 0.0179     | 0.0048              | 0.0160   | 0.0158   | 0.0051                | 0.0156   | 0.0148   |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -                           | 0.0005                  | 0.0001   | 0.0005   | 0.0005              | 0.0001     | 0.0005   | <0.00050               | <0.00010   | <0.00050   | 0.0005              | 0.0001   | 0.0005   | 0.0005                | 0.0001   | 0.0005   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                  | 0.00005  | 0.0005   | 0.0005              | 0.00005    | 0.0005   | <0.00050               | <0.000050  | <0.00050   | 0.0005              | 0.00005  | 0.0005   | 0.0005                | 0.00005  | 0.0005   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                    | 0.01     | 0.01     | 0.01                | 0.01       | 0.01     | <0.010                 | <0.010     | <0.010     | 0.01                | 0.01     | 0.01     | 0.01                  | 0.01     | 0.01     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | 0.000028                | 0.000005 | 0.000010 | 0.00001             | 0.00001    | 0.00001  | <0.000010              | <0.0000050 | <0.000010  | 0.00001             | 0.00001  | 0.00001  | 0.00001               | 0.00001  | 0.00001  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 6.2                     | 16.0     | 23.9     | 4.8                 | 14.5       | 21.4     | 9.4                    | 29.4       | 36.7       | 4.8                 | 15.4     | 23.1     | 5.2                   | 15.2     | 21.9     |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.0005                  | 0.00198  | 0.00050  | 0.00057             | 0.00260    | 0.00050  | <0.00050               | <0.00050   | <0.00050   | 0.00050             | 0.00225  | 0.00050  | 0.00050               | 0.00185  | 0.00050  |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | 0.00010                 | 0.00042  | 0.00010  | 0.00017             | 0.00054    | 0.00010  | 0.00016                | <0.00010   | 0.00017    | 0.00011             | 0.00047  | 0.00010  | 0.00010               | 0.00041  | 0.00010  |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.0027                  | 0.0021   | 0.0010   | 0.0009              | 0.0025     | 0.0012   | 0.0005                 | <0.0010    | 0.0009     | 0.0007              | 0.0023   | 0.0013   | 0.0008                | 0.0021   | 0.0011   |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.874                       | 0.104                   | 0.941    | 0.080    | 0.281               | 1.215      | 0.125    | 0.202                  | 0.028      | 0.050      | 0.201               | 0.961    | 0.176    | 0.181                 | 0.920    | 0.111    |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.00023                 | 0.00073  | 0.00009  | 0.00034             | 0.00089    | 0.00013  | 0.00021                | <0.000050  | <0.000050  | 0.00021             | 0.00075  | 0.00017  | 0.00020               | 0.00074  | 0.00009  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                  | 0.0020   | 0.0010   | 0.0010              | 0.0024     | 0.0010   | <0.0010                | 0.0026     | 0.0018     | 0.0010              | 0.0021   | 0.0011   | 0.0010                | 0.0020   | 0.0010   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 3.4                     | 9.0      | 13.3     | 2.6                 | 8.8        | 12.4     | 6.7                    | 21.4       | 27.8       | 3.1                 | 9.1      | 13.8     | 3.2                   | 9.1      | 13.1     |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.0025                  | 0.0119   | 0.0013   | 0.0072              | 0.0146     | 0.0017   | 0.0091                 | 0.0010     | 0.0018     | 0.0049              | 0.0123   | 0.0024   | 0.0050                | 0.0132   | 0.0024   |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.000005                | 0.000005 | 0.000005 | 0.000005            | 0.00000505 | 0.000005 | <0.0000050             | <0.0000050 | <0.0000050 | 0.000005            | 0.000005 | 0.000005 | 0.000005              | 0.000005 | 0.000005 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00007                 | 0.00043  | 0.00043  | 0.00005             | 0.00038    | 0.00049  | 0.00010                | 0.00049    | 0.00041    | 0.00007             | 0.00055  | 0.00059  | 0.00011               | 0.00040  | 0.00059  |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00146                 | 0.00144  | 0.00050  | 0.00057             | 0.00204    | 0.00051  | <0.00050               | 0.00057    | <0.00050   | 0.00050             | 0.00183  | 0.00062  | 0.00056               | 0.00167  | 0.00071  |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.61                    | 1.65     | 1.45     | 0.51                | 1.71       | 1.50     | 0.65                   | 1.81       | 1.69       | 0.51                | 1.62     | 1.55     | 0.59                  | 1.56     | 1.47     |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.001                   | 0.00005  | 0.001    | 0.001               | 0.00005    | 0.001    | <0.0010                | 0.00007    | <0.0010    | 0.001               | 0.00005  | 0.001    | 0.001                 | 0.00005  | 0.001    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.69                    | 2.25     | 0.95     | 0.76                | 2.71       | 0.98     | 0.64                   | 1.00       | 1.09       | 0.77                | 2.30     | 1.11     | 0.75                  | 2.37     | 0.97     |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.00001                 | 0.00005  | 0.00001  | 0.00001             | 0.00005    | 0.00001  | <0.000010              | <0.000050  | <0.000010  | 0.00001             | 0.00005  | 0.00001  | 0.00001               | 0.00005  | 0.00001  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.9                     | 4.6      | 5.8      | 0.6                 | 4.0        | 5.8      | 0.4                    | 3.2        | 3.4        | 0.6                 | 3.8      | 5.6      | 0.8                   | 3.9      | 5.2      |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0054                  | 0.0214   | 0.0252   | 0.0046              | 0.0188     | 0.0244   | 0.0099                 | 0.0414     | 0.0373     | 0.0051              | 0.0194   | 0.0257   | 0.0048                | 0.0192   | 0.0237   |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.00010                 | 0.00002  | 0.00010  | 0.00010             | 0.00003    | 0.00010  | <0.00010               | <0.00010   | <0.00010   | 0.00010             | 0.00003  | 0.00010  | 0.00010               | 0.00003  | 0.00010  |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.0004                  | 0.0001   | 0.0001   | 0.0001              | 0.0001     | 0.0001   | <0.00010               | <0.00010   | <0.00010   | 0.0001              | 0.0001   | 0.0001   | 0.0001                | 0.0001   | 0.0001   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.010                   | 0.065    | 0.010    | 0.015               | 0.082      | 0.010    | 0.011                  | 0.002      | <0.010     | 0.012               | 0.065    | 0.011    | 0.010                 | 0.074    | 0.010    |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.0004                  | 0.0054   | 0.0072   | 0.0003              | 0.0040     | 0.0065   | 0.0003                 | 0.0037     | 0.0048     | 0.0003              | 0.0039   | 0.0061   | 0.0003                | 0.0036   | 0.0054   |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | 0.0010                  | 0.00192  | 0.00100  | 0.00100             | 0.00247    | 0.00100  | <0.0010                | <0.00050   | <0.0010    | 0.00100             | 0.00206  | 0.00100  | 0.00100               | 0.00178  | 0.00100  |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.013                   | 0.009    | 0.003    | 0.003               | 0.0037     | 0.003    | <0.0030                | <0.0030    | <0.0030    | 0.003               | 0.0041   | 0.0146   | 0.0034                | 0.0031   | 0.0030   |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Mary River

### 5.1.2 Phytoplankton

Chlorophyll-a concentrations at MRTF were comparable to those reported at upstream reference stations during individual spring, summer, and fall sampling events in 2020 (Appendix Table E.14), and were well below the AEMP benchmark of 3.7 µg/L for each of these sampling events. Low phytoplankton productivity, indicative of oligotrophic conditions, was suggested at MRTF based on comparison of chlorophyll-a concentrations to Dodds et al (1998) trophic status classification for creek environments. Overall, no mine-related influences on phytoplankton density were suggested at MRTF in 2020 based on the chlorophyll-a concentration data.

### 5.1.3 Benthic Invertebrate Community

No ecologically significant differences in benthic invertebrate density and richness were indicated between the MRTF effluent-exposed and reference study areas during the August 2020 EEM study (Table 5.2)<sup>15</sup>. Significantly higher evenness at the MRTF effluent-exposed area compared to the reference area, as well as significantly differing Bray-Curtis Index between these areas, indicated differing benthic invertebrate assemblages between the effluent-exposed and reference areas of MRTF. The primary difference in community composition between the effluent-exposed and reference areas of MRTF was a significantly lower relative abundance of Chironomidae at the effluent-exposed area, including those considered metal-sensitive (Table 5.2). A lower relative abundance of metal-sensitive Chironomidae at the effluent-exposed area suggested that the difference in benthic invertebrate assemblage between areas was potentially related to mine effluent, but because aqueous metal concentrations at MRTF were mostly below WQG (Table 5.1), a factor (or factors) other than metal concentrations likely accounted for the differences in assemblage between the MRTF study areas. For instance, a significantly higher relative abundance of the filterer FFG at the MRTF effluent-exposed area suggested that organic inputs from the effluent channel may have contributed to community composition differences relative to the MRTF upstream reference area (Minnow 2020). Overall, influences of mine operations on the benthic invertebrate community of MRTF remained uncertain following the August 2020 EEM study, but did not appear to be related to metal concentrations originating from mine effluent and/or operations.

<sup>15</sup> Under the MDMER, metrics of richness, Simpson's Evenness, and Bray-Curtis Index are calculated using family-level taxonomy, and thus the MRTF benthic invertebrate community results discussed herein evaluated metrics calculated using this level of taxonomy. For all monitoring conducted for the Mary River Project CREMP, the above metrics were calculated using lowest-practical-level taxonomy.



**Table 5.2: Benthic Invertebrate Community Metric Statistical Comparisons Between Mary River Tributary-F (MRTF) Mine-Exposed (EXP) and Reference (REF) Areas, Mary River Project Second EEM Study, August 2020**

| Endpoint              |                               | Data Transformation          | Test       | Test P-value | MCT <sup>a</sup> |       | MOD (REF <sub>SD</sub> ) |
|-----------------------|-------------------------------|------------------------------|------------|--------------|------------------|-------|--------------------------|
|                       |                               |                              |            |              | REF              | EXP   |                          |
| EEM Effect Indicators | Density (No./m <sup>2</sup> ) | log10                        | tequal     | 0.009        | 324              | 87.3  | -1.6                     |
|                       | Richness (No. of Taxa)        | log10                        | tequal     | 0.151        | 12.6             | 9.17  | ns                       |
|                       | Simpson's Evenness            | log10                        | tequal     | 0.087        | 0.372            | 0.538 | 1                        |
| Group Percentage (%)  | Taxa                          | Chironomidae                 | log10      | 0.029        | 76.3             | 52.8  | -3.9                     |
|                       |                               | Metal Sensitive Chironomidae | log10      | 0.005        | 50.8             | 21.0  | -4.1                     |
|                       |                               | Simuliidae                   | log10(x+1) | 0.118        | 2.8              | 19.2  | ns                       |
|                       |                               | Tipulidae                    | log10(x+1) | 0.996        | 16.3             | 16.2  | ns                       |
|                       | FFG                           | Collector-Gatherer           | log10      | 0.054        | 77.3             | 53.5  | -3.5                     |
|                       |                               | Filterer                     | log10(x+1) | 0.07         | 3.3              | 20.3  | 11.4                     |

 P-value < 0.1.

 P-value < 0.1 and MOD < -2.

 P-value < 0.1 and MOD > 2.

Note: MOD = Magnitude of Difference =  $(MCT_{Exp} - MCT_{Ref})/SD_{Ref}$ . FFG = Functional Feeding Group.

<sup>a</sup> MCT = Measure of Central Tendency; MCT reported as median for rank-transformed data and as back-transformed mean for all other cases.

#### 5.1.4 Effects Assessment and Recommendations

Water chemistry at MRTF (Station F0-01) met all AEMP benchmarks consistently over the duration of spring, summer, and fall sampling events in 2020, and for parameters with established AEMP benchmarks, no changes in concentrations were shown relative to baseline. No adverse effects on phytoplankton were indicated at MRTF in 2020. Biological sampling conducted at MRTF to meet MDMER obligations suggested some differences in benthic invertebrate community assemblages between effluent-exposed and reference areas, but these differences did not appear to be related to metal concentrations originating from mine effluent and/or mine operations (Minnow 2021). Under the Mary River Project AEMP Management Response Framework, the absence of a mine-related change in AEMP benchmark parameters over time (or compared to background) requires no further management response (Figure 2.8). Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and to baseline, and no adverse biological effects related to metals were indicated in 2020, no adjustment to the existing AEMP need be applied at MRTF as part of the next monitoring program.

### 5.2 Mary River

#### 5.2.1 Water Quality

Dissolved oxygen in water at Mary River stations was consistently at or above saturation during all spring, summer, and fall monitoring events, and showed comparable saturation among the G0-09 series reference stations and stations adjacent to (E0 series) and downstream (C0 series) of the Mary River Project for each respective seasonal sampling event in 2020 (Figure 5.1; Appendix Tables C.1 to C.3). Dissolved oxygen concentrations were significantly higher at Mary River benthic study areas located adjacent to (E0-01, E0-20) and downstream (C0-05) of the mine than at the upstream (G0-09, G0-03) study areas in August 2020, suggesting no increased oxygen demand associated with mine operations (Appendix Figure C.22; Appendix Table C.56). In addition, dissolved oxygen concentrations were consistently well above WQG acceptable levels for sensitive life stages of cold-water biota (i.e., 9.5 mg/L) at all Mary River stations in spring, summer, and fall of 2020 (Figure 5.1; Appendix Figure C.18; Appendix Table C.55), indicating that slight differences in dissolved oxygen concentrations among the Mary River study areas were not likely to be ecologically meaningful.

In situ pH at all Mary River mine-exposed stations was generally comparable to pH at the G0-09 series reference stations during the spring, summer, and fall sampling events in 2020 (Figure 5.1). Although significant differences in pH were indicated between area E0-20 adjacent to the mine and the G0-09 reference area, the mean incremental difference in pH between these areas was







**Figure 5.1: Comparison of *In Situ* Water Quality Variables Measured at Mary River Water Quality Monitoring Stations in Spring, Summer, and Fall 2020, Mary River Project CREMP**

less than a pH unit, and pH at all Mary River areas were consistently within WQG limits (Figure 5.1; Appendix Table C.57), suggesting that any pH differences among the Mary River study areas were not likely to be ecologically meaningful. Specific conductance was consistently lowest in spring and highest in fall at all Mary River stations (Figure 5.1), reflecting natural seasonal differences related to proportion of flow from surface runoff (e.g., spring snowmelt) and baseflow/groundwater sources. Specific conductance was considerably higher at Mary River Tributary-F than at all other monitoring stations, which suggested that this tributary was a key source of mine-related inputs to Mary River (e.g., MS-08 effluent; Figure 5.1). Within Mary River, specific conductance was significantly higher in the portion of the river adjacent to the mine (immediately downstream of the MRTF confluence) at E0 series stations, but not downstream of the mine at the C0 series sampling locations at the time of biological monitoring in August 2020 (Appendix Figure C.22; Appendix Table C.57), suggesting that mine-related influences on Mary River water quality were of limited spatial scale.

Within Mary River, mean concentrations of aluminum and iron were above their respective AEMP benchmarks at stations located adjacent to (E0 series) and downstream of (C0 series) the mine in 2020, but only during the summer sampling event (Table 5.1). In addition, mean concentrations of total aluminum, copper, and phosphorus were above applicable WQG in spring, summer, and/or fall sampling events in 2020 at the E0 and C0 series stations (Table 5.1). However, in all cases in which the AEMP benchmarks and WQG were exceeded at areas adjacent to and downstream of the mine, the mean concentrations for each of these parameters were similar or higher, and above applicable AEMP benchmark and WQG values, at the Mary River reference stations (G0-09 series) and/or other upstream stations (G0 series) for each given seasonal sampling event (Table 5.1).<sup>16</sup> Relatively high concentrations of these parameters within Mary River at the time of the summer sampling event relative to the spring and fall sampling events appeared to be associated with highly turbid sampling conditions in the summer (Table 5.1). Concentrations of aluminum, copper, iron, and phosphorus were lower at MRTF than at the Mary River reference and mine-exposed stations (Table 5.1), suggesting that this mine-exposed tributary was not a substantial source of these parameters in 2020. Among those parameters with established AEMP benchmarks, nitrate and sulphate concentrations were elevated by factors greater than three only at Station E0-10, downstream of the confluence with MRTF, and only during the spring and fall sampling events in 2020 (Appendix Table C.62). Therefore, elevation in concentrations of nitrate and sulphate in Mary River appeared to be associated with mine deposits to MRTF (e.g., MS-08 effluent). Nitrate, and sulphate to a lesser

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<sup>16</sup> Previous CREMP studies also showed total aluminum concentrations above respective WQG and/or AEMP benchmarks at Mary River GO series reference stations, indicating naturally high concentrations of this metal in Mary River.



extent, were also the only two parameters that were elevated at Mary River stations adjacent to (E0 series) and downstream of (C0 series) the mine in 2020 compared to baseline that also did not show an elevation over time at the Mary River reference area (Appendix Figure C.23), indicating that higher concentrations of these parameters was mine-related. Overall, no marked influences on water quality of Mary River were indicated in 2020 as a result of mine operations except for slight enrichment of nitrate and sulphate concentrations near the mine, although to levels that remained well below AEMP benchmarks.

### 5.2.2 Sediment Quality

Deposited sediment sampled from Mary River study areas was mostly medium-sized coarse sand and some gravel (Appendix Table D.33). Substrate among the Mary River study areas was largely composed of cobble and boulder material with minimal amounts of sand and finer material except at the downstream-most study area C0-05, where medium-sized sand composed approximately 65% of the surficial in-stream substrate (Minnow 2018). Silt precipitate and/or deposits were generally absent from all Mary River mine-exposed study areas during the August 2020 sampling event (Appendix Table D.33). Sediment TOC content was low (i.e., <0.2%) at all Mary River study areas, and generally did not differ between the mine-exposed areas and the upstream reference area (G0-09), suggesting similar depositional characteristics among the Mary River study areas (Table 5.3; Appendix Table D.36).

Metal concentrations in sediment from all Mary River study areas were highly comparable (Table 5.3; Appendix Table D.36). The only notable difference was a slight elevation (i.e., 3-fold) in the concentration of molybdenum at E0-20 compared to the average concentration at the upstream G0-09 reference area (Table 5.3; Appendix Table D.36). Concentrations of metals in deposited sediment were also well below applicable SQG at all Mary River study areas (Table 5.3; Appendix Tables D.34, D.35, and D.37 to D.39).

### 5.2.3 Phytoplankton

Chlorophyll-a concentrations at Mary River stations located downstream of the mine were generally within the range of, or slightly higher, than the G0 series river reference stations and/or creek reference stations during the 2020 spring, summer, and fall sampling events (Figure 5.2). Chlorophyll-a concentrations were consistently well below the AEMP benchmark of 3.7 µg/L during all winter, summer, and fall sampling events at all Mary River sampling stations in 2020, and were suggestive of low (i.e., oligotrophic) phytoplankton productivity based on Dodds et al (1998) trophic status classification for stream environments. Therefore, no adverse mine-related influences on phytoplankton abundance were indicated at Mary River in 2020. Low to moderate phytoplankton productivity was expected for Mary River reference and mine-exposed stations in



**Table 5.3: Sediment Total Organic Carbon and Metal Concentrations at Mary River Mine-Exposed and Reference (GO-09) Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter       | Units | SQG <sup>a</sup>     | Mary River Reference<br>(GO-09; n = 3) | Upstream<br>GO-03<br>(n = 3) | Mary River Mine-Exposed Areas |                              |                                |
|-----------------|-------|----------------------|----------------------------------------|------------------------------|-------------------------------|------------------------------|--------------------------------|
|                 |       |                      |                                        |                              | Adjacent<br>EO-01<br>(n = 3)  | Adjacent<br>EO-20<br>(n = 3) | Downstream<br>CO-05<br>(n = 3) |
|                 |       |                      | Average ± SD                           | Average ± SD                 | Average ± SD                  | Average ± SD                 | Average ± SD                   |
| TOC             | %     | 10 <sup>α</sup>      | 0.11 ± 0.012                           | 0.11 ± 0.012                 | 0.11 ± 0.010                  | 0.19 ± 0.10                  | 0.12 ± 0.015                   |
| Aluminum (Al)   | mg/kg | -                    | 2,757 ± 1,141                          | 2,000 ± 688                  | 2,407 ± 438                   | 4,217 ± 2,456                | 2,468 ± 1,366                  |
| Antimony (Sb)   | mg/kg | -                    | <0.10 ± 0                              | <0.10 ± 0                    | <0.10 ± 0                     | <0.10 ± 0                    | <0.10 ± 0                      |
| Arsenic (As)    | mg/kg | 17                   | 0.38 ± 0.10                            | 1.10 ± 1.15                  | 0.41 ± 0.059                  | 0.62 ± 0.12                  | 0.37 ± 0.27                    |
| Barium (Ba)     | mg/kg | -                    | 12.6 ± 5.05                            | 9.39 ± 3.05                  | 11.3 ± 1.92                   | 20.7 ± 9.70                  | 10.2 ± 5.51                    |
| Beryllium (Be)  | mg/kg | -                    | 0.14 ± 0.040                           | 0.11 ± 0.023                 | 0.11 ± 0.010                  | 0.24 ± 0.19                  | 0.13 ± 0.044                   |
| Bismuth (Bi)    | mg/kg | -                    | <0.20 ± 0                              | <0.20 ± 0                    | 0.24 ± 0.075                  | 0.30 ± 0.18                  | <0.20 ± 0                      |
| Boron (B)       | mg/kg | -                    | 5.4 ± 0.75                             | <5.0 ± 0                     | <5.0 ± 0                      | 6.7 ± 2.9                    | <5.0 ± 0                       |
| Cadmium (Cd)    | mg/kg | 3.5                  | <0.020 ± 0                             | <0.020 ± 0                   | 0.026 ± 0.0053                | 0.038 ± 0.020                | <0.020 ± 0                     |
| Calcium (Ca)    | mg/kg | -                    | 2,750 ± 894                            | 2,080 ± 249                  | 2,353 ± 454                   | 2,887 ± 1,147                | 2,046 ± 1,384                  |
| Chromium (Cr)   | mg/kg | 90                   | 13.6 ± 4.34                            | 13.7 ± 3.49                  | 18.7 ± 10.8                   | 26.1 ± 5.37                  | 14.1 ± 10.9                    |
| Cobalt (Co)     | mg/kg | -                    | 2.40 ± 0.758                           | 1.96 ± 0.468                 | 2.58 ± 0.850                  | 3.88 ± 1.21                  | 2.32 ± 1.45                    |
| Copper (Cu)     | mg/kg | 110 <sup>α</sup>     | 4.45 ± 2.50                            | 2.78 ± 1.01                  | 4.05 ± 0.215                  | 7.40 ± 2.27                  | 3.14 ± 1.84                    |
| Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 11,063 ± 2,423                         | 13,633 ± 3,099               | 16,950 ± 13,939               | 19,233 ± 6,401               | 6,443 ± 4,132                  |
| Lead (Pb)       | mg/kg | 91                   | 3.07 ± 0.857                           | 2.74 ± 0.567                 | 2.78 ± 0.477                  | 4.27 ± 1.48                  | 2.30 ± 1.00                    |
| Lithium (Li)    | mg/kg | -                    | 5.0 ± 2.3                              | 3.5 ± 1.2                    | 3.4 ± 0.57                    | 6.33 ± 4.44                  | 4.8 ± 2.9                      |
| Magnesium (Mg)  | mg/kg | -                    | 2,810 ± 1,212                          | 1,793 ± 389                  | 2,630 ± 251                   | 4,440 ± 2,669                | 3,380 ± 2,370                  |
| Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 76 ± 29.4                              | 58.6 ± 14.3                  | 85.4 ± 25.4                   | 137 ± 39                     | 72.5 ± 41.1                    |
| Mercury (Hg)    | mg/kg | 0.486                | <0.0050 ± 0                            | 0.0050 ± 0.00006             | <0.005 ± 0                    | <0.0050 ± 0                  | <0.0050 ± 0                    |
| Molybdenum (Mo) | mg/kg | -                    | 0.11 ± 0.023                           | <0.10 ± 0                    | 0.20 ± 0.085                  | 0.36 ± 0.20                  | 0.12 ± 0.025                   |
| Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 6.11 ± 1.99                            | 4.83 ± 1.12                  | 8.27 ± 2.03                   | 16.7 ± 6.30                  | 14.2 ± 12.9                    |
| Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 350 ± 118                              | 400 ± 50.5                   | 383 ± 136                     | 376 ± 76                     | 270 ± 167                      |
| Potassium (K)   | mg/kg | -                    | 750 ± 320                              | 507 ± 189                    | 617 ± 129                     | 1,167 ± 650                  | 517 ± 297                      |
| Selenium (Se)   | mg/kg | -                    | <0.20 ± 0                              | <0.20 ± 0                    | <0.20 ± 0                     | 0.20 ± 0                     | <0.20 ± 0                      |
| Silver (Ag)     | mg/kg | -                    | <0.10 ± 0                              | <0.10 ± 0                    | <0.10 ± 0                     | 0.13 ± 0.046                 | <0.10 ± 0                      |
| Sodium (Na)     | mg/kg | -                    | 68 ± 21                                | <50 ± 9                      | <50 ± 0                       | 67 ± 29                      | 57 ± 12                        |
| Strontium (Sr)  | mg/kg | -                    | 4.72 ± 1.01                            | 3.99 ± 0.183                 | 3.75 ± 0.376                  | 4.69 ± 1.69                  | 3.28 ± 1.30                    |
| Sulphur (S)     | mg/kg | -                    | <1,000 ± 0                             | <1,000 ± 0                   | <1,000 ± 0                    | <1,000 ± 0                   | <1,000 ± 0                     |
| Thallium (Tl)   | mg/kg | -                    | 0.068 ± 0.023                          | 0.053 ± 0.0058               | <0.050 ± 0                    | 0.086 ± 0.048                | 0.062 ± 0.0061                 |
| Tin (Sn)        | mg/kg | -                    | <2.0 ± 0                               | <2.0 ± 0                     | <2.0 ± 0                      | <2.0 ± 0                     | <2.0 ± 0                       |
| Titanium (Ti)   | mg/kg | -                    | 353 ± 123                              | 263 ± 50                     | 294 ± 21                      | 396 ± 133                    | 255 ± 141                      |
| Uranium (U)     | mg/kg | -                    | 0.922 ± 0.298                          | 0.822 ± 0.199                | 0.785 ± 0.189                 | 1.09 ± 0.328                 | 0.725 ± 0.586                  |
| Vanadium (V)    | mg/kg | -                    | 19.5 ± 5.06                            | 23.8 ± 4.93                  | 22.7 ± 18.3                   | 25.9 ± 9.83                  | 9.26 ± 5.56                    |
| Zinc (Zn)       | mg/kg | 315                  | 10.3 ± 4.31                            | 7.8 ± 2.3                    | 10.3 ± 1.04                   | 17.0 ± 7.91                  | 9.17 ± 5.46                    |
| Zirconium (Zr)  | mg/kg | -                    | 5.8 ± 2.0                              | 4.4 ± 1.4                    | 3.8 ± 0.49                    | 5.7 ± 3.1                    | 3.1 ± 1.5                      |

 Indicates parameter concentration above SQG.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

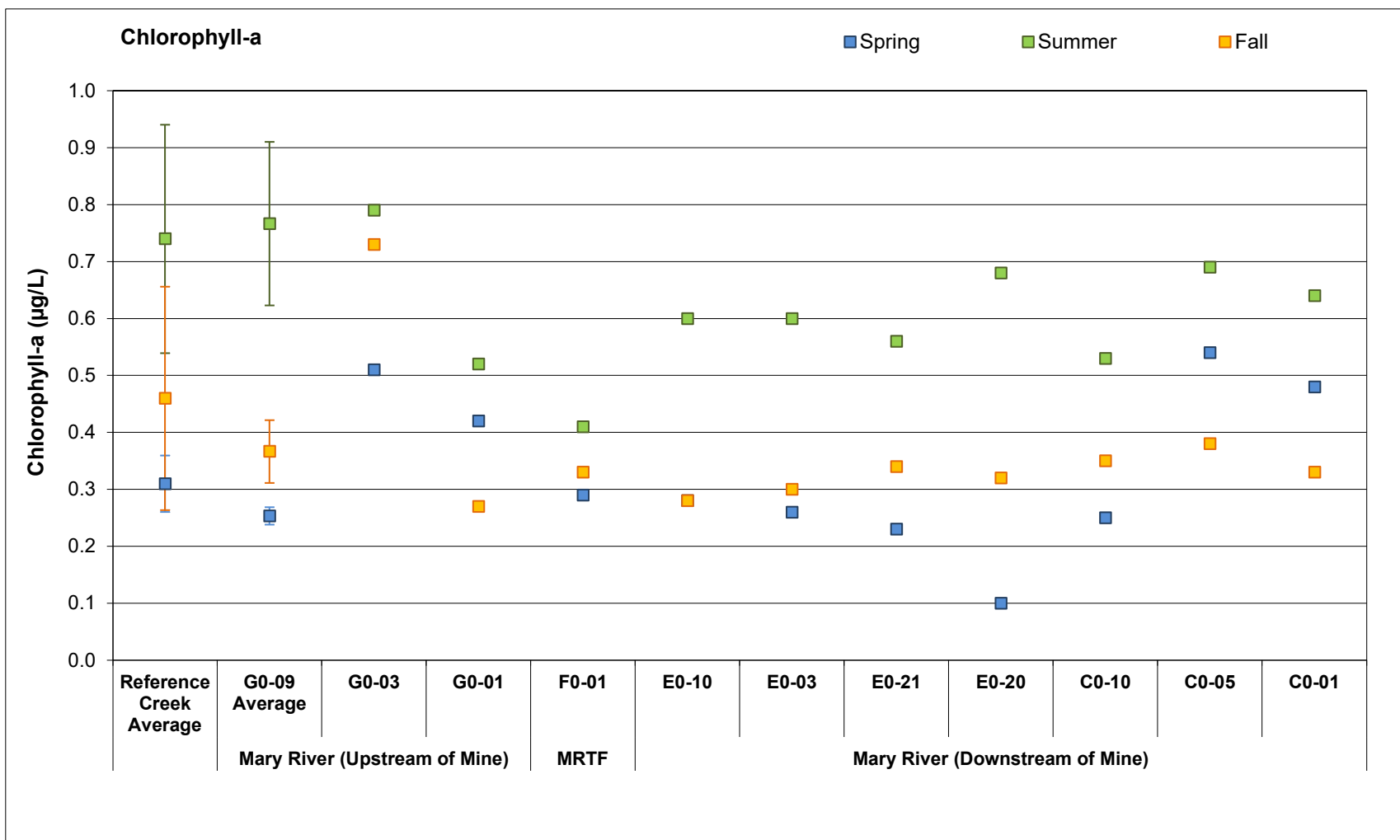


**Figure 5.2: Chlorophyll-a Concentrations at Mary River Phytoplankton Monitoring Stations Located Upstream and Downstream of the Mine, Mary River Project CREMP, 2020**

Note: Reference creek data represented by average ( $\pm$  SD;  $n = 4$ ) calculated from CLT-REF and MRY-REF stations.

2020 given 'oligotrophic' to 'mesotrophic' productivity categorizations based on CWQG classifications that use total phosphorus concentrations to define trophic status (Table 5.1; Appendix Table C.58).

Chlorophyll-a concentrations at Mary River mine-exposed and reference stations in fall 2020 were generally similar to those shown at the time of baseline and previous years of mine operation (Figure 5.3). Chlorophyll-a concentrations in fall 2020 were not disproportionately higher or lower compared to baseline at the mine-exposed stations of Mary River compared to the reference stations, suggesting no adverse change/differences in phytoplankton abundance due to mine-related influences over time.

#### **5.2.4 Benthic Invertebrate Community**

The Mary River benthic invertebrate community assessment included a spatial statistical analysis of endpoints among an upstream reference area (G0-09), an upstream area with limited mine exposure (G0-03), two near-field mine-exposed areas located near the mine (E0-01, E0-20), and a far-field cumulative effects mine-exposed area located downstream of the mine (C0-05; see Table 2.5). At the Mary River G0-03 study area, no ecologically significant differences in benthic invertebrate density, richness, evenness, and relative abundance of metal-sensitive taxa were indicated compared to the G0-09 reference area, suggesting no marked influences of the mine operation on the benthic invertebrate community. Some differences in community assemblage were suggested between G0-03 and G0-09 study areas by differing Bray-Curtis Index (Appendix Table F.51) and significantly higher and lower relative abundance of Hydracarina and Chironomidae groups, respectively, at G0-03 in 2020 (Table 5.4). However, the relative abundance of these groups at G0-03 in 2020 did not differ significantly from baseline (Appendix Table F.50), suggesting that the differences in assemblage between G0-03 and G0-09 study areas in 2020 reflected natural variability.

At the near-field mine exposed study areas (i.e., E0-01 and E0-20), no ecologically significant differences in density, richness, evenness, and the proportion of metal-sensitive Chironomidae were indicated relative to the reference study area (Table 5.4; Appendix Table F.50). Differing Bray-Curtis Index suggested differing community composition between the E0 and G0-09 study areas, but no significant differences in the relative abundance of any dominant groups were indicated in 2020 (Table 5.4; Appendix Table F.51). Rather, the differences in community composition at E0-01 and E0-20 compared to the G0-09 reference area appeared to reflect lower relative abundance of the collector-gatherer FFG and the sprawler HPG at one or both of the E0 study areas (Appendix Table F.50), potentially indicating habitat differences between the E0 and G0-09 study areas. No ecologically significant differences in density, richness, evenness (E0-20 study area only) and relative abundance of dominant



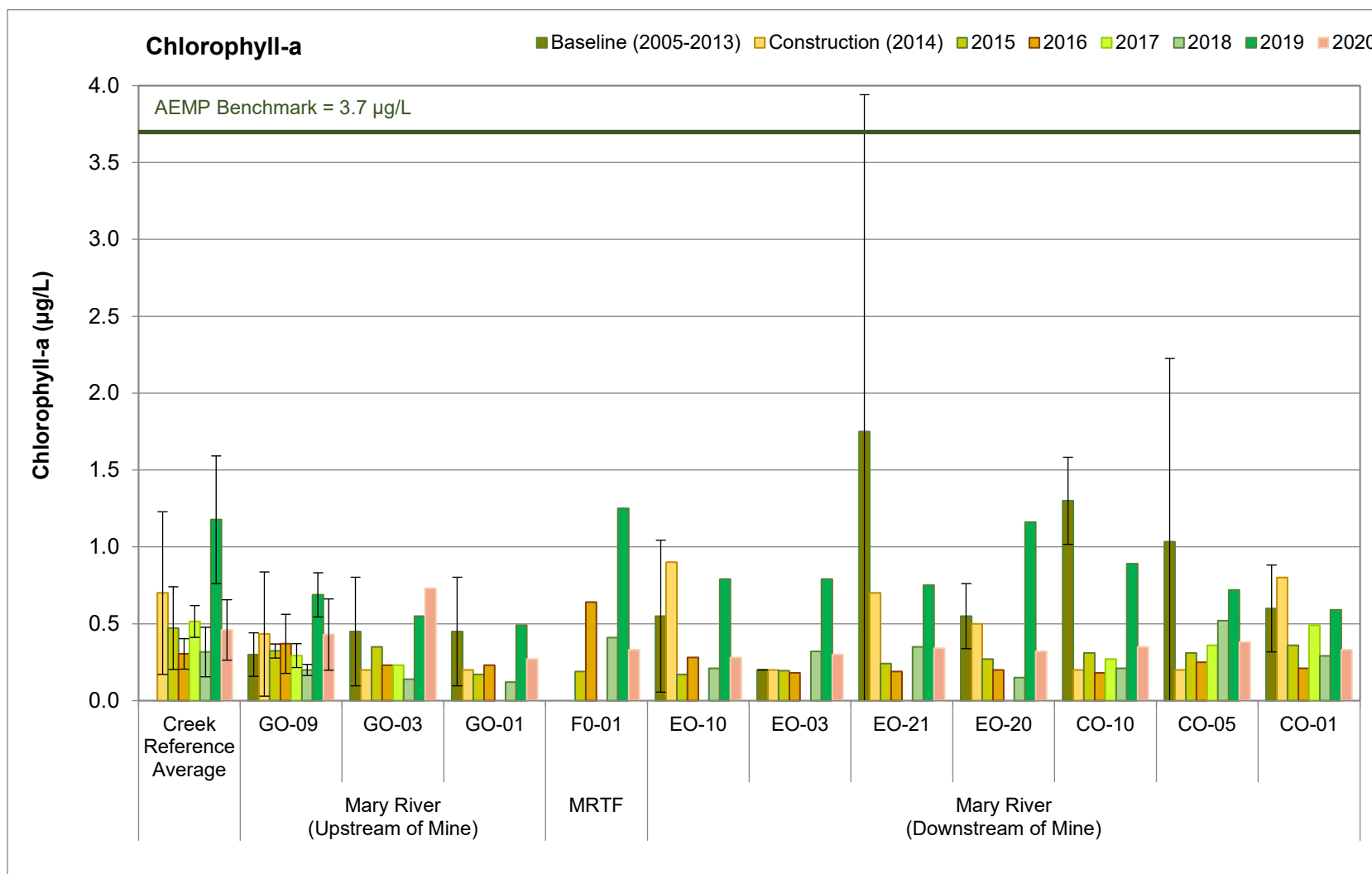


**Figure 5.3: Temporal Comparison of Chlorophyll-a Concentrations at Mary River Stations for Mine Baseline (2005 to 2013), Construction (2014), and Operational (2015 to 2020) Periods during the Fall**

Note: Reference creek data represented by average ( $\pm$  SD;  $n = 4$ ) calculated from CLT-REF and MRY-REF stations.



**Table 5.4: Benthic Invertebrate Community Metric Statistical Comparison Results among Mary River Reference (GO-09), Upstream (GO-03), and Mine-Exposed (EO-01, EO-20, CO-05) Study Areas, Mary River Project CREMP, August 2020**

| Metric                                        | Data Transform-ation | Overall 5-Area Comparison           |         | Pair-wise, post-hoc comparisons <sup>a</sup> |       |                    |                     |                     |
|-----------------------------------------------|----------------------|-------------------------------------|---------|----------------------------------------------|-------|--------------------|---------------------|---------------------|
|                                               |                      | Significant Difference Among Areas? | P-value | Area                                         | Mean  | Standard Deviation | Effect Size         | Pairwise Comparison |
|                                               |                      |                                     |         |                                              |       |                    | vs. GO-09 Reference |                     |
| Density (No. per m <sup>2</sup> )             | rank                 | YES                                 | 0.019   | GO-09 Ref                                    | 886   | 831                | -                   | a                   |
|                                               |                      |                                     |         | GO-03                                        | 196   | 95.3               | -0.8                | b                   |
|                                               |                      |                                     |         | EO-01                                        | 513   | 420                | -0.4                | a                   |
|                                               |                      |                                     |         | EO-20                                        | 1,441 | 553                | 0.7                 | a                   |
|                                               |                      |                                     |         | CO-05                                        | 906   | 818                | 0.0                 | a                   |
| Richness (No. of Taxa)                        | none                 | NO                                  | 0.710   | GO-09 Ref                                    | 15.0  | 2.0                | -                   | a                   |
|                                               |                      |                                     |         | GO-03                                        | 13.6  | 3.3                | -0.7                | a                   |
|                                               |                      |                                     |         | EO-01                                        | 15.6  | 2.1                | 0.3                 | a                   |
|                                               |                      |                                     |         | EO-20                                        | 14.0  | 2.6                | -0.5                | a                   |
|                                               |                      |                                     |         | CO-05                                        | 14.2  | 2.2                | -0.4                | a                   |
| Simpson's Evenness                            | rank                 | YES                                 | 0.036   | GO-09 Ref                                    | 0.826 | 0.153              | -                   | ab                  |
|                                               |                      |                                     |         | GO-03                                        | 0.918 | 0.024              | 0.6                 | a                   |
|                                               |                      |                                     |         | EO-01                                        | 0.913 | 0.016              | 0.6                 | a                   |
|                                               |                      |                                     |         | EO-20                                        | 0.868 | 0.046              | 0.3                 | b                   |
|                                               |                      |                                     |         | CO-05                                        | 0.839 | 0.048              | 0.1                 | b                   |
| Hydracarina (% of community)                  | rank                 | YES                                 | 0.058   | GO-09 Ref                                    | 1.1   | 1.3                | -                   | a                   |
|                                               |                      |                                     |         | GO-03                                        | 4.3   | 3.1                | 2.4                 | b                   |
|                                               |                      |                                     |         | EO-01                                        | 3.1   | 2.9                | 1.5                 | ab                  |
|                                               |                      |                                     |         | EO-20                                        | 0.8   | 0.4                | -0.2                | a                   |
|                                               |                      |                                     |         | CO-05                                        | 6.0   | 4.9                | 3.8                 | b                   |
| Chironomidae (% of community)                 | none                 | YES                                 | 0.002   | GO-09 Ref                                    | 89.6  | 5.1                | -                   | a                   |
|                                               |                      |                                     |         | GO-03                                        | 69.9  | 13.6               | -3.9                | b                   |
|                                               |                      |                                     |         | EO-01                                        | 88.2  | 9.2                | -0.3                | a                   |
|                                               |                      |                                     |         | EO-20                                        | 95.5  | 2.5                | 1.2                 | a                   |
|                                               |                      |                                     |         | CO-05                                        | 84.8  | 8.0                | -0.9                | a                   |
| Tipulidae (% of community)                    | rank                 | YES                                 | 0.003   | GO-09 Ref                                    | 1.2   | 0.5                | -                   | b                   |
|                                               |                      |                                     |         | GO-03                                        | 6.2   | 5.1                | 10.6                | b                   |
|                                               |                      |                                     |         | EO-01                                        | 5.7   | 4.3                | 9.5                 | b                   |
|                                               |                      |                                     |         | EO-20                                        | 0.6   | 0.9                | -1.4                | b                   |
|                                               |                      |                                     |         | CO-05                                        | 1.4   | 0.9                | 0.3                 | b                   |
| Metal Sensitive Chironomidae (% of community) | log10                | YES                                 | 0.043   | GO-09 Ref                                    | 32.0  | 23.7               | -                   | a                   |
|                                               |                      |                                     |         | GO-03                                        | 12.3  | 5.8                | -0.8                | ab                  |
|                                               |                      |                                     |         | EO-01                                        | 11.0  | 2.5                | -0.9                | ab                  |
|                                               |                      |                                     |         | EO-20                                        | 9.4   | 9.1                | -1.0                | b                   |
|                                               |                      |                                     |         | CO-05                                        | 19.4  | 9.6                | -0.5                | ab                  |

Indicates a significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Post-hoc analysis of 1-way ANOVA among all areas protected for multiple comparisons.

taxonomic groups (including metal-sensitive Chironomids) were indicated between mine operational years (2015 to 2020) and baseline (2007) at either of the E0 near-field study areas (Appendix Tables F.54 and F.56). Although evenness has consistently been significantly higher at an absolute magnitude greater than 2 SDREF in years of mine operation compared to baseline at the E0-01 study area, higher evenness is not associated with an adverse influence and thus was not consistent with effects to the benthic invertebrate community normally attributed to mine operations.

At far-field mine-exposed area CO-05, no ecologically significant differences in benthic invertebrate density, richness, evenness, and relative abundance of metal-sensitive taxa were indicated compared to the G0-09 reference area, suggesting no marked influences of the mine operation on the benthic invertebrate community. Although differences in community assemblage were suggested between the CO-05 and G0-09 study areas by differing Bray-Curtis Index (Appendix Table F.51), only a significantly higher relative abundance of Hydracarina was indicated between these study areas in 2020 (Table 5.4). No ecologically significant differences in density, richness, evenness, and dominant taxonomic groups were indicated at CO-05 for all years of mine operation (2015 to 2020) compared to one or both years of baseline period data (2007 and 2011; Appendix Table F.58). Therefore, no adverse effects of mine-operations on the benthic invertebrate community at Mary River CO-05 were indicated since the commencement of commercial mine operations in 2015.

### 5.2.5 Fish Community and Population Health

The fish community of Mary River was composed of arctic charr and low numbers of ninespine stickleback, and was comparable to the Angajurjualuk Lake Tributary reference area during the EEM fish survey in August 2020 in terms of both species composition and fish abundance as reflected by CPUE (Table 5.5). Similar fish species composition was indicated within Mary River between EEM studies conducted in 2017 and 2020, and although arctic charr CPUE was higher in 2020, this likely reflected lower water levels resulting in improved sampling efficiency compared to the 2017 study (Minnow 2021).

The length-frequency distribution of arctic charr captured at Mary River adjacent to the mine differed significantly from the distribution shown at the Angajurjualuk Lake Tributary reference area, but did not differ significantly from the distribution shown farther downstream in Mary River near Mary Lake (Table 5.6). Similar length-at-age relationships were indicated for arctic charr sampled at Mary River adjacent to the mine compared to the Angajurjualuk Lake Tributary reference area and Mary River near the outlet to Mary Lake, suggesting that the difference in arctic charr length-frequency distribution between Mary River and Angajurjualuk Lake Tributary was a sampling artifact (Minnow 2021). No significant differences in length, weight, growth



**Table 5.5:** Summary of Fish Catches at Mary River Project Second EEM Study Fish Population Study Areas, August 2020

| Study Area                                    | Total Effort         |                        | Summary Statistic Endpoint | Fish Species     |                      |                       | Catch Summary |                   |
|-----------------------------------------------|----------------------|------------------------|----------------------------|------------------|----------------------|-----------------------|---------------|-------------------|
|                                               | Distance Sampled (m) | Electrofishing Seconds |                            | Arctic Char      |                      | Ninespine Stickleback | Totals        | Total No. Species |
|                                               |                      |                        |                            | YOY <sup>b</sup> | Non-YOY <sup>b</sup> |                       |               |                   |
| Angajurjualuk Lake Tributary Reference (ALTR) | 234                  | 2,226                  | Total No. Caught           | 0                | 104                  | 2                     | 106           | 2                 |
|                                               |                      |                        | CPUE <sup>a</sup>          | 0                | 2.80                 | 0.05                  | 2.86          |                   |
| Mary River Reference (MRR)                    | 200                  | 2,972                  | Total No. Caught           | 0                | 122                  | 35                    | 157           | 2                 |
|                                               |                      |                        | CPUE <sup>a</sup>          | 0                | 2.46                 | 0.71                  | 3.17          |                   |
| Mary River Effluent-Exposed (MRE)             | 228                  | 2,241                  | Total No. Caught           | 0                | 122                  | 0                     | 122           | 1                 |
|                                               |                      |                        | CPUE <sup>a</sup>          | 0                | 3.27                 | 0                     | 3.27          |                   |

<sup>a</sup> Electrofishing catch-per-unit-effort (CPUE) represents number of fish captured per minute of electrofishing.

<sup>b</sup> Young-of-the-year (YOY).

**Table 5.6: Summary of Arctic Charr Endpoint Statistical Comparison Results Between Effluent-Exposed and Reference Areas Used for the Mary River Project First and Second EEM Studies, August 2017 and 2020**

| Endpoint <sup>a</sup>                         | Applicable Critical Effect Size | Sample Size      | Statistically Significant Differences Observed? <sup>b</sup> |                    |                   |                   |            |
|-----------------------------------------------|---------------------------------|------------------|--------------------------------------------------------------|--------------------|-------------------|-------------------|------------|
|                                               |                                 |                  | First EEM (2017)                                             |                    | Second EEM (2020) |                   |            |
|                                               |                                 |                  | Test                                                         | MRE vs MRR         | Test              | MRE vs ALTR       | MRE vs MRR |
| Survival (Age Frequency Distribution)*        | none                            | 100 <sup>c</sup> | K-S                                                          | No                 | K-S               | <b>Yes (-22%)</b> | No         |
| Survival (Age)*                               | ± 25%                           | 20               | n/a                                                          | n/a                | K-W               | <b>Yes (+50%)</b> | No         |
| Body Size (Fork Length)                       | none                            | 100 <sup>c</sup> | t-test                                                       | No                 | K-W               | <b>Yes (+12%)</b> | No         |
|                                               |                                 | 20               | n/a                                                          | n/a                | ANOVA             | No                | No         |
| Body Size (Body Weight)                       | none                            | 100              | t-test                                                       | No                 | K-W               | <b>Yes (+36%)</b> | No         |
|                                               |                                 | 20               | n/a                                                          | n/a                | ANOVA             | No                | No         |
| Energy Usage (Length-at-age)                  | none                            | 20               | n/a                                                          | n/a                | ANCOVA            | No                | No         |
| Energy Usage (Weight-at-age)*                 | ± 25%                           | 20               | n/a                                                          | n/a                | ANCOVA            | No                | No         |
| Energy Storage (liver weight at body weight)* | ± 25%                           | 20               | n/a                                                          | n/a                | ANOVA             | No                | No         |
| Energy Storage (condition)*                   | ± 10%                           | 100 <sup>c</sup> | ANCOVA                                                       | <b>Yes (-4.5%)</b> | ANCOVA            | No                | No         |
|                                               |                                 | 20               | n/a                                                          | n/a                | ANCOVA            | No                | No         |

 Indicates an absolute magnitude of difference (MOD) greater than applicable Critical Effect Size for fish population survey EEM effect indicators.

Notes: YOY = young-of-the year; MRR = Mary River reference area; MRE = Mary River effluent-exposed area; ALTR = Angajurjua Lake Tributary reference area; n/a indicates endpoint not applicable (i.e., endpoint associated with lethal sampling).

<sup>a</sup> Endpoints denoted with an asterisk represent primary EEM endpoints used for the determination of "effects" for a lethal fish population study.

<sup>b</sup> Information provided indicates whether a significant difference occurred between areas (**yes/no**) and the magnitude of difference for any differences (in parentheses).

<sup>c</sup> Sample size varied between areas. In First Study, n=100 at the effluent-exposed and reference area. In Second Study, n=108 for length measures and 100 for weight and condition measures at the effluent-exposed area, and n=100 at the reference areas.

(i.e., body weight-at-age), relative liver size (i.e., liver weight-at-body weight), or condition (i.e., body weight-at-fork length) were indicated for arctic charr sampled at Mary River adjacent to the mine compared to those sampled at either the Angajurjualuk Lake Tributary reference area or Mary River near the outlet to Mary Lake (Table 5.6). In addition, no externally visible abnormalities or parasitic infections were observed on any arctic charr captured at the Mary River effluent exposed area (Minnow 2021). Muscle tissue selenium concentrations in arctic charr captured at Mary River did not differ significantly to those captured at the Angajurjualuk Lake Tributary reference area, and were well below the USEPA (2016) chronic effects criterion of 11.3 mg/kg dry weight for protection of aquatic life (Figure 5.4), suggesting reproductive impairments (e.g., deformities, mortality) to Mary River arctic charr were highly unlikely. Overall, the absence of any significant differences in EEM effect indicators related to growth, relative liver size, condition, and tissue selenium concentrations in arctic charr captured at Mary River compared to applicable reference areas indicated no marked influence of mine operations on the health of arctic charr at Mary River in 2020 (Minnow 2021).

#### 5.2.6 Effects Assessment and Recommendations

At Mary River, the following AEMP benchmarks were exceeded in 2020:

- Aluminum concentration in water was greater than the benchmark of 0.966 mg/L adjacent to (i.e., E0-series stations) and downstream of (i.e., C0-series stations) of the mine during the summer sampling event;
- Copper concentration in water was greater than the benchmark of 0.0024 mg/L adjacent to (i.e., E0-series stations) and downstream of (i.e., C0-series stations) of the mine during the summer sampling event;
- Iron concentration in water was greater than the benchmark of 0.874 mg/L adjacent to (i.e., E0-series stations) and downstream of (i.e., C0-series stations) of the mine during the summer sampling event; and,
- Lead concentration in water was greater than the benchmark of 0.001 mg/L adjacent to (i.e., E0-series stations) the mine during the summer sampling event.

Within Mary River, concentrations of aluminum, copper, iron, and lead were above respective AEMP benchmarks at stations located adjacent to the mine (i.e., E0 series stations) and, with the exception of lead, downstream of the mine (C0 series) in 2020, but only during the summer



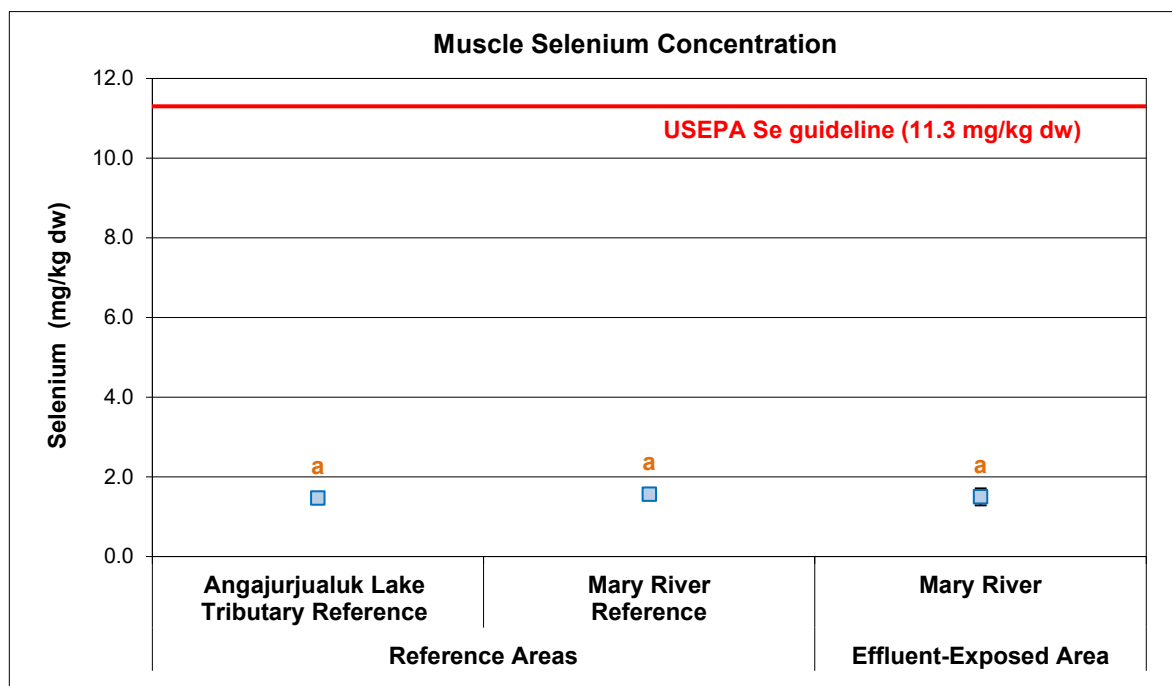


**Figure 5.4: Selenium Concentrations (mean  $\pm$  SD; n = 8) in Dorsal Muscle Tissue of Arctic Charr Captured at Mary River Effluent-Exposed and Reference Study Areas During the Second EEM Study, August 2020**

Note: Data points with the same letters do not differ significantly.

sampling event.<sup>17</sup> However, in all cases in which the AEMP benchmarks were exceeded, the concentrations for each of these parameters were similar or higher, and above applicable AEMP benchmarks, at the Mary River reference stations (G0-09 series) and/or upstream stations (G0 series) at the time of the summer sampling event.<sup>18</sup> Relatively high concentrations of these parameters within Mary River at the time of the summer sampling event appeared to be associated with highly turbid conditions compared to the spring and fall sampling events. Concentrations of aluminum, copper, iron, and lead in water at Mary River stations located adjacent to and downstream of the mine in 2020 were comparable to concentrations at each station in each season during baseline. Therefore, no mine-related changes to parameter concentrations were indicated at Mary River mine-exposed stations in 2020 compared to the reference stations and to Mary River baseline data. In addition, metal concentrations in sediment were well below SQG, and no adverse effects on phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at all Mary River mine-exposed areas in 2020. Under the Mary River Project AEMP Management Response Framework, the absence of a mine-related change in AEMP benchmark parameters over time (or compared to background) requires no further management response (Figure 2.8). Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no management response (i.e., alteration of existing AEMP) is required for Mary River as part of the next monitoring program.

### **5.3 Mary Lake**

#### **5.3.1 Water Quality**

Water quality profiles conducted at the north and south basins of Mary Lake showed similar patterns in water temperature from the surface to bottom as those shown at Reference Lake 3 for summer and fall sampling events in 2020 (Figures 5.5 and 5.6). At the north basin, development of an epilimnion occurred through the surficial 5 m and a hypolimnion was evident at depths greater than approximately 11 m in the fall (Figure 5.5). No distinct thermal layering was evident at the north basin of Mary Lake in the winter and fall, or at the south basin for any seasons although a clear gradient in water temperature was evident in summer (Figures 5.5 and 5.6).

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<sup>17</sup> The reported concentration of zinc at Station E0-03 was above the AEMP benchmark during the summer sampling event but this result appeared to be an anomaly based on an order of magnitude difference in concentration between this station and data reported for all other Mary River stations in summer 2020 (Appendix Table C.59).

<sup>18</sup> Cadmium, copper, and zinc concentrations in water were above AEMP benchmarks at the Mary River upstream reference stations (i.e., Station G0-09) in spring 2020, indicating the potential for natural elevation of these parameters in Mary River adjacent to and downstream of the mine.





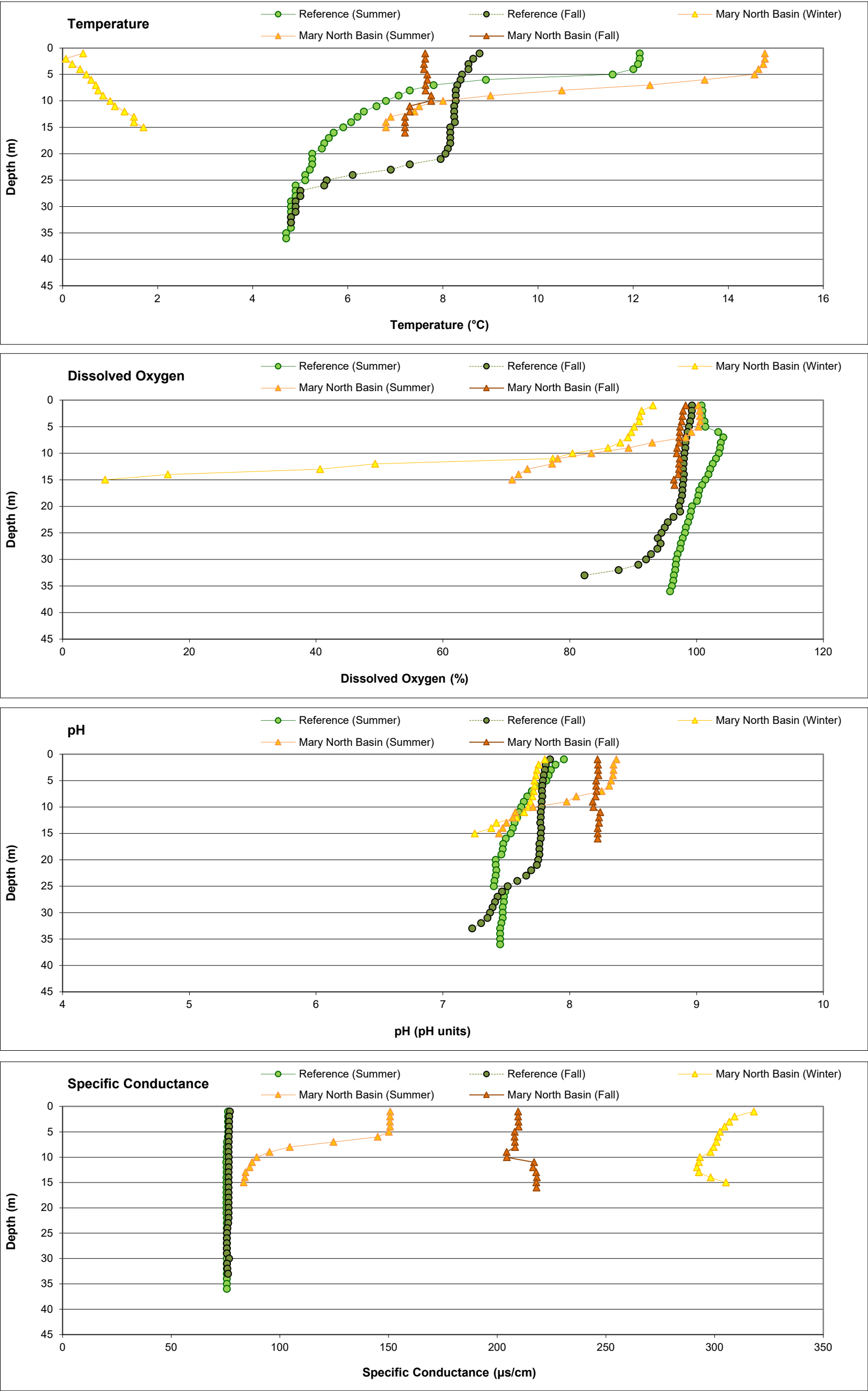


**Figure 5.5:** Average *In Situ* Water Quality with Depth from Surface at the Mary Lake North Basin (BLO) Compared to Reference Lake 3 during Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

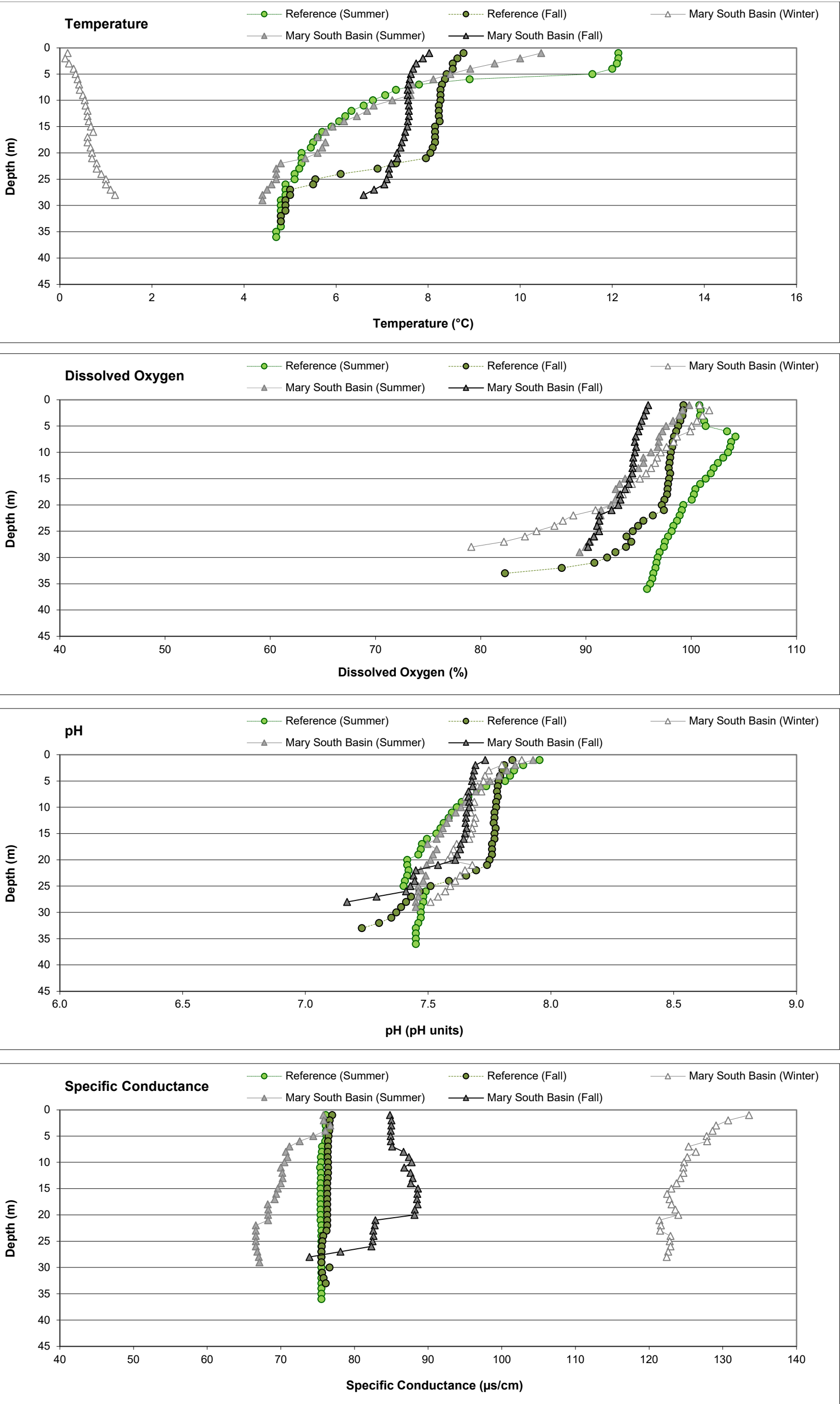


**Figure 5.6: Average *In Situ* Water Quality with Depth from Surface at the Mary Lake South Basin (BLO) Compared to Reference Lake 3 during Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020**

Water temperatures at the bottom of the water column at Mary Lake littoral and profundal stations did not differ significantly from those at like-habitat stations of Reference Lake 3 during the August 2020 biological study (Figure 5.7; Appendix Table C.65). Dissolved oxygen profiles showed the development of moderate to strong oxyclines extending through the entire water column at both the Mary Lake north and south basins for winter and summer sampling events in 2020 (Figures 5.5 and 5.6). The dissolved oxygen profiles conducted during summer and fall at Mary Lake mirrored similar profiles at the reference lake except for in summer at the north basin. Dissolved oxygen concentrations near the bottom of the water column were significantly lower at Mary Lake littoral and profundal stations than like-habitat stations at the reference lake during the August 2020 biological study. However, dissolved oxygen concentrations were above the WQG for the protection of sensitive populations of cold-water species (i.e., 9.5 mg/L) at all littoral and profundal stations of Mary Lake during the August 2020 study (Figure 5.7; Appendix Table C.65).

Water column profiles showed slightly decreasing pH with increased depth at Mary Lake north and south basins, comparable to those at Reference Lake 3, during winter and summer sampling events in 2020, with the changes in pH through the water column at both lakes appearing to coincide with changes in water temperature during each given season (Figures 5.5 and 5.6). The pH near the bottom of the water column at littoral stations of Mary Lake did not differ significantly from the reference lake, but was significantly higher at profundal stations of Mary Lake compared to the reference lake during the August 2020 biological study (Figure 5.7). The mean incremental difference in bottom pH at profundal stations between lakes was small (less than a pH unit) and pH was consistently within WQG limits at all Mary Lake stations (Figure 5.7, Appendix Table C.65), and therefore this pH difference between lakes was not ecologically meaningful. Specific conductance was substantially higher at the north basin compared to the south basin of Mary Lake (Figures 5.5 and 5.6; Appendix Figure C.28), likely reflecting natural differences in dominant inflow sources to Mary Lake (i.e., Tom River inflow to the north basin, and the Mary River inflow to the south basin) and natural differences in geochemistry associated with these inflows. Specific conductance profiles showed variable changes from the surface to bottom of the water column at the north basin, but were relatively uniform at the south basin, over winter, summer, and fall sampling events in 2020 (Appendix Figure C.28). The differences between basins may have reflected differing influence associated with the dominant inflows to the lake and the station location relative to these inflows. Specific conductance near the bottom of the water column at littoral and profundal stations of Mary Lake did not differ significantly from like-habitat stations at Reference Lake 3 during the August 2020 biological study (Figure 5.7). Water clarity, as determined using Secchi depth



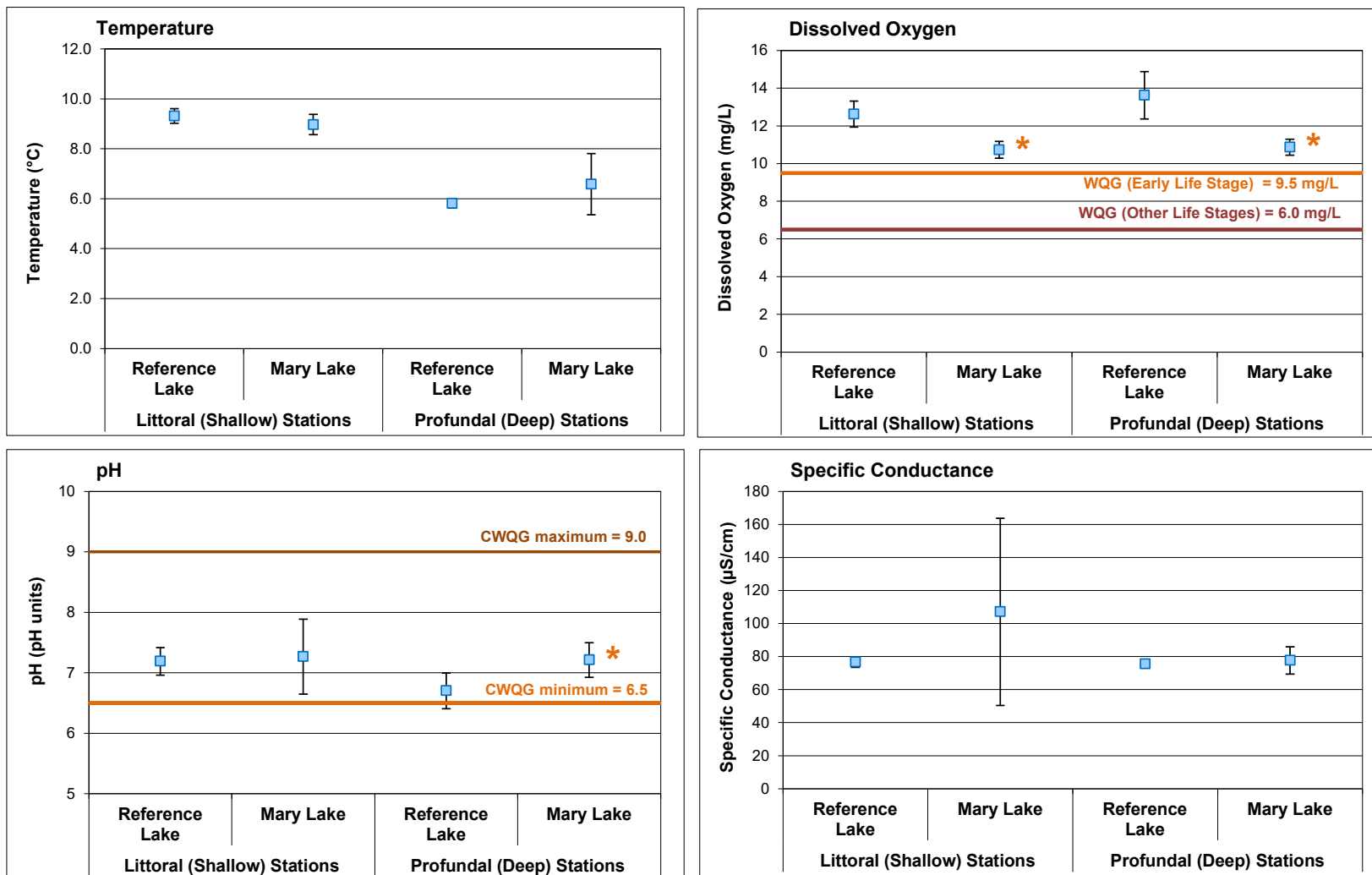


**Figure 5.7: Comparison of *In Situ* Water Quality Variables (mean  $\pm$  SD) Measured at Mary Lake (BLO) and Reference Lake 3 (REF3) Littoral and Profundal Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

Note: An asterisk (\*) next to data point indicates mean value differs significantly from the Reference Lake 3 mean for the respective littoral or profundal station type.

readings, was significantly lower at Mary Lake compared to Reference Lake 3 in August 2020 (Appendix Table C.64; Appendix Figure C.8).

Water chemistry at Mary Lake north and south basins met all AEMP benchmarks and WQG over the duration of spring, summer, and fall sampling events in 2020 (Table 5.7). Among those parameters with established AEMP benchmarks, chloride concentrations were elevated at the north basin, and aluminum concentrations were elevated at both the north and south basins of Mary Lake compared to Reference Lake 3 in the summer and fall sampling events (Table 5.7; Appendix Table C.69). Of those parameters without AEMP benchmarks, turbidity was elevated at the north and south basins of Mary Lake, and total and dissolved manganese and uranium concentrations were elevated at the north basin of Mary Lake compared to the reference lake in both summer and fall sampling events in 2020 (Appendix Tables C.67). Similar to the Sheardown Lake system, elevated total aluminum concentrations at Mary Lake compared to the reference lake in 2020 were connected to naturally higher turbidity at Mary Lake and thus was unrelated to the mine operations.<sup>19</sup> Average concentrations of all parameters, including those with or without established AEMP benchmarks and, for metals, whether in total or dissolved form, were comparable between 2020 and baseline for the Mary River north basin and south basin (Appendix Figure C.29; Appendix Tables C.68, C.70, C.72, and C.73). Overall, mine-related influences on water quality of Mary Lake in 2020 included a slight elevation in chloride, manganese, and uranium concentrations compared to the reference lake. However, the occurrence of water quality below AEMP benchmarks and lack of water chemistry changes over time suggested no adverse mine-related influences on water chemistry of Mary Lake since the initiation of commercial mine operations in 2015.

### 5.3.2 Sediment Quality

Surficial sediment of the Mary Lake north basin (BLO-01) was mainly composed of silt with low TOC content (Figure 5.8; Appendix Table D.42). Sediments from the Mary Lake south basin also had low TOC content (i.e., <1.5%) and were predominantly composed of silt except at stations BLO-03 (profundal) and BLO-11 (littoral), which contained 92% and 79% sand, respectively (Figure 5.8; Appendix Table D.42). Substrate from Mary Lake was similar to that of Reference Lake 3 in terms of particle size, but had significantly lower TOC and moisture

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<sup>19</sup> Turbidity at Mary Lake in 2020 was comparable to turbidity shown at the lake during baseline (Appendix Table C.69), suggesting that greater turbidity at this lake compared to Reference Lake 3 reflected natural phenomena. The occurrence of similar dissolved concentrations of aluminum between Mary Lake and Reference Lake 3 in 2020 (and historically) indicated that aluminum was associated with particulate material suspended in the water column, and thus was unlikely to be associated with mine-related source.



Table 5.7: Mean Water Chemistry at Mary Lake North Basin (BL0-01) and South Basin (BL0) Monitoring Stations<sup>a</sup>, During Winter, Summer, and Fall Sampling Events, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>b</sup> | AEMP Benchmark <sup>c</sup> | Reference Lake 3 (n = 3) |          | Mary Lake North Basin Stations (n = 3) |          |          | Mary Lake South Basin Stations (n = 7) |          |          |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|--------------------------|----------|----------------------------------------|----------|----------|----------------------------------------|----------|----------|
|                        |                                    |         |                                            |                             | Summer                   | Fall     | Winter                                 | Summer   | Fall     | Winter                                 | Summer   | Fall     |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 79                       | 79       | 303                                    | 136      | 221      | 129                                    | 78       | 88       |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.66                     | 7.75     | 7.66                                   | 8.11     | 8.21     | 7.65                                   | 7.66     | 7.73     |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 35                       | 38       | 156                                    | 63       | 106      | 67                                     | 34       | 41       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.0                      | 2.0      | 2.0                                    | 2.0      | 2.0      | 2.0                                    | 2.2      | 2.1      |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 41                       | 51       | 178                                    | 83       | 130      | 85                                     | 50       | 52       |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.15                     | 0.1      | 0.1                                    | 0.9      | 0.6      | 0.1                                    | 2.0      | 1.4      |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 46                       | 34       | 132                                    | 61       | 96       | 59                                     | 43       | 38       |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.010                    | 0.014    | 0.010                                  | 0.010    | 0.010    | 0.010                                  | 0.010    | 0.010    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.020                    | 0.020    | 0.119                                  | 0.008    | 0.044    | 0.052                                  | 0.037    | 0.043    |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.005                    | 0.005    | 0.005                                  | 0.001    | 0.005    | 0.005                                  | 0.008    | 0.005    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.15                     | 0.16     | 0.16                                   | 0.11     | 0.16     | 0.16                                   | 0.15     | 0.15     |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.3                      | 3.5      | 3.5                                    | 2.3      | 2.8      | 3.1                                    | 2.2      | 1.9      |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.6                      | 3.8      | 4.9                                    | 1.7      | 10.5     | 3.6                                    | 3.0      | 2.3      |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.004                    | 0.003    | 0.003                                  | 0.005    | 0.008    | 0.003                                  | 0.005    | 0.005    |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | 0.0010                   | 0.001    | 0.002                                  | 0.001    | 0.001    | 0.0016                                 | 0.0010   | 0.0011   |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | 0.10                     | 0.10     | 0.10                                   | 0.05     | 0.10     | 0.10                                   | 0.16     | 0.10     |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.4                      | 1.37     | 17.52                                  | 4.18     | 9.42     | 4.56                                   | 2.75     | 3.40     |
| Total Metals           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 3.6                      | 3.64     | 7.32                                   | 1.86     | 4.02     | 3.87                                   | 1.84     | 2.34     |
|                        | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.130                       | 0.0031                   | 0.0032   | 0.0035                                 | 0.0254   | 0.0199   | 0.0061                                 | 0.0648   | 0.0383   |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0001                   | 0.00010  | 0.0001                                 | 0.0001   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.0001                   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0064                   | 0.0070   | 0.0145                                 | 0.0071   | 0.0107   | 0.0070                                 | 0.0046   | 0.0051   |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | 0.0005                   | 0.0005   | 0.0005                                 | 0.0001   | 0.0005   | 0.0005                                 | 0.0005   | 0.0005   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | 0.0005                   | 0.0005   | 0.0005                                 | 0.00005  | 0.0005   | 0.0005                                 | 0.0005   | 0.0005   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.01                     | 0.01     | 0.01                                   | 0.01     | 0.01     | 0.01                                   | 0.01     | 0.01     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | 0.00001                  | 0.00001  | 0.00001                                | 0.000005 | 0.00001  | 0.00001                                | 0.00001  | 0.00001  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.2                      | 7.2      | 31.1                                   | 12.7     | 21.3     | 13.0                                   | 7.0      | 7.9      |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.0005                   | 0.0005   | 0.00050                                | 0.00013  | 0.00050  | 0.0005                                 | 0.0005   | 0.0005   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | 0.0001                   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00073                  | 0.00075  | 0.00115                                | 0.00092  | 0.00097  | 0.00074                                | 0.00059  | 0.00059  |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.03                     | 0.030    | 0.032                                  | 0.030    | 0.030    | 0.030                                  | 0.065    | 0.040    |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.00005                  | 0.00005  | 0.00005                                | 0.00005  | 0.00005  | 0.000050                               | 0.000071 | 0.000050 |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0010                   | 0.0010   | 0.0014                                 | 0.0010   | 0.0014   | 0.0010                                 | 0.0010   | 0.0010   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.24                     | 4.7      | 19.3                                   | 7.7      | 12.7     | 7.8                                    | 4.1      | 4.9      |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.00080                  | 0.00068  | 0.00392                                | 0.00421  | 0.00240  | 0.00051                                | 0.00201  | 0.00115  |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | 0.000005                 | 0.000005 | 0.000005                               | 0.000005 | 0.000005 | 0.000005                               | 0.000005 | 0.000005 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00013                  | 0.00015  | 0.00037                                | 0.00020  | 0.00032  | 0.00024                                | 0.00100  | 0.00017  |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00050                  | 0.00050  | 0.00075                                | 0.00052  | 0.00050  | 0.00050                                | 0.00050  | 0.00050  |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.86                     | 0.90     | 1.41                                   | 0.87     | 1.16     | 0.84                                   | 0.57     | 0.63     |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.001                    | 0.001    | 0.001                                  | 0.00005  | 0.001    | 0.001                                  | 0.001    | 0.001    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.495                    | 0.50     | 1.51                                   | 0.67     | 0.74     | 0.61                                   | 0.53     | 0.49     |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | 0.00001                  | 0.00001  | 0.00001                                | 0.00001  | 0.00001  | 0.00001                                | 0.00001  | 0.00001  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.89                     | 0.96     | 6.88                                   | 2.38     | 4.33     | 2.10                                   | 1.29     | 1.60     |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0084                   | 0.0082   | 0.0224                                 | 0.0098   | 0.0163   | 0.0115                                 | 0.0062   | 0.0070   |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.00010                  | 0.0001   | 0.0001                                 | 0.0000   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | 0.0001                   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   | 0.0001                                 | 0.0001   | 0.0001   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.01                     | 0.0100   | 0.0100                                 | 0.0009   | 0.01     | 0.01                                   | 0.01     | 0.01     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.0003                   | 0.0003   | 0.0045                                 | 0.0012   | 0.00344  | 0.00135                                | 0.00070  | 0.00097  |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | 0.0010                   | 0.0010   | 0.0010                                 | 0.0005   | 0.0010   | 0.0010                                 | 0.0010   | 0.0010   |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0030                   | 0.0030   | 0.0030                                 | 0.0030   | 0.003    | 0.003                                  | 0.004    | 0.003    |

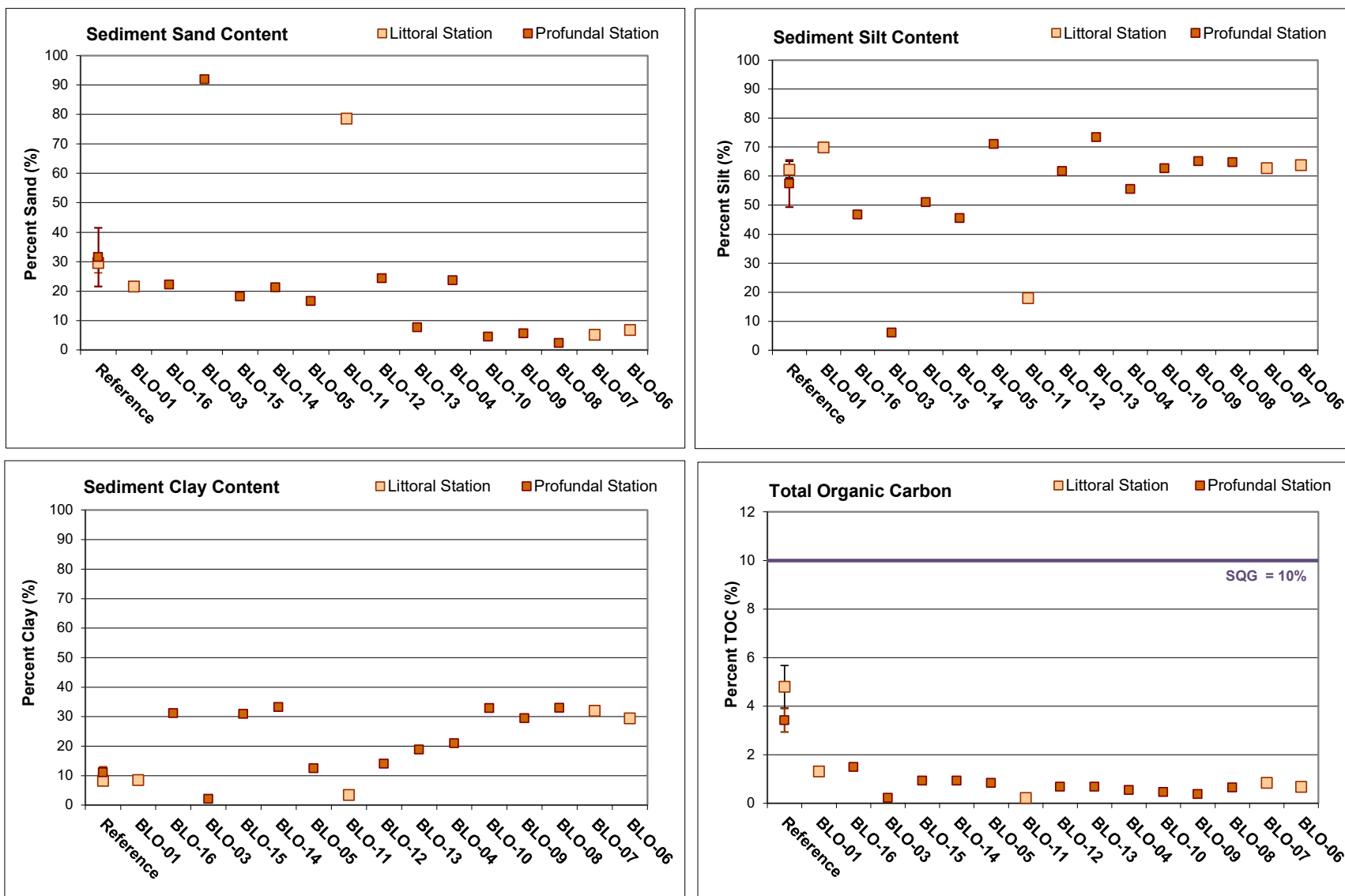
Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Values presented are averages from samples taken from the surface and the bottom of the water column at each lake for the indicated season

<sup>b</sup> Canadian Water Quality Guideline (CCME 1999, 2017) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2017). See Table 2.2 for information regarding WQG criteria.

<sup>c</sup> AEMP Water Quality Benchmarks developed by Intrinsic (2013) using baseline water quality data (2006 to 2013) specific to Mary Lake.





content for both littoral and profundal habitat (Appendix Table D.43). Reddish-brown coloured iron (oxy)hydroxide material was evident at various sediment sampling locations throughout Mary Lake (Appendix Tables D.40 and D.41), mirroring similar observations at Reference Lake 3 and the other mine-exposed lakes where such material was commonly visible as a thin, distinct layer or floc on or within surficial sediment. Substrate of Mary Lake also commonly contained sub-surface blackening/dark colouration indicating the presence of reduced sediment, but no distinct redox boundaries were observed (Appendix Tables D.40 and D.41). Similar sub-surface reducing conditions were observed in sediment of the reference lake, including the absence of distinct redox boundaries (Appendix Tables D.3 and D.4), suggesting that factors leading to reduced sediment conditions were comparable between lakes.

Metal concentrations in sediment at Mary Lake were comparable to those of Reference Lake 3 in 2020 except for slightly (i.e., 3- to 5-fold) higher concentrations of zirconium at both littoral and profundal habitat (Appendix Table D.44). At the lone Mary Lake north basin station (i.e., BLO-01), concentrations of all metals in sediment were below applicable SQG and lake-specific AEMP benchmarks except for manganese, which exceeded the SQG only (Table 5.8). In the south basin, concentrations of chromium and iron in sediment from the littoral station, and mean manganese concentrations in sediments from the profundal stations, were above applicable SQG but not lake-specific AEMP benchmarks (Table 5.8). Metal concentrations in sediment at the Mary Lake south basin showed no spatial gradients with progression from the Mary River inlet to the lake outlet among the profundal stations (Appendix Table D.42).<sup>20</sup> As indicated previously, mean concentrations of iron and manganese were elevated above SQG in sediment at the reference lake (Table 5.8), suggesting that concentrations of iron and manganese above SQG at Mary Lake likely reflected a natural condition unrelated to mine activity.

Metal concentrations in sediment at littoral and profundal stations of Mary Lake in 2020 have not changed substantially from those observed during the mine baseline (2005 to 2013) period (Figure 5.9; Appendix Table D.44).<sup>21</sup> On average, metal concentrations in sediment from Mary Lake were within the range of those observed from 2015 to 2019 and there was no evidence of an increasing trend over time for any metals (Figure 5.9). Overall, no changes in metal concentrations in sediment were apparent in sediments at Mary Lake since the initiation of commercial mine operations in 2015.

<sup>20</sup> Spatially, the order of sediment quality from closest to Mary River to the lake outlet were as follows: BLO-12, BLO-10, BLO-09, BLO-08, and BLO-06 (Figure 2.4). All of these stations, except BLO-06, were profundal.

<sup>21</sup> See footnote 6 regarding differences in the concentration of boron in sediment between baseline and recent CREMP studies.



**Table 5.8: Sediment Total Organic Carbon and Metal Concentrations at Mary Lake North Basin (BLO-01) and South Basin (BLO), and Reference Lake 3 (REF3) Sediment Monitoring Stations, Mary River Project CREMP, August 2020**

| Parameter |                 | Units | SQG <sup>a</sup>     | AEMP Benchmark <sup>b</sup> | Littoral               |                         |                         | Profundal              |                                 |
|-----------|-----------------|-------|----------------------|-----------------------------|------------------------|-------------------------|-------------------------|------------------------|---------------------------------|
|           |                 |       |                      |                             | Reference Lake (n = 5) | Mary Lake North (n = 1) | Mary Lake South (n = 1) | Reference Lake (n = 5) | Mary Lake (South Basin) (n = 8) |
|           |                 |       |                      |                             | Average ± SD           |                         |                         | Average ± SD           | Average ± SD                    |
| TOC       |                 | %     | 10 <sup>α</sup>      | -                           | 4.80 ± 1.96            | 1.31                    | 0.68                    | 3.42 ± 1.08            | 0.71 ± 0.34                     |
| Metals    | Aluminum (Al)   | mg/kg | -                    | -                           | 16,880 ± 1,785         | 15,000                  | 29,600                  | 21,800 ± 2,185         | 22,616 ± 2,156                  |
|           | Antimony (Sb)   | mg/kg | -                    | -                           | <0.10 ± 0              | <0.10                   | <0.10                   | <0.10 ± 0              | <0.10 ± 0                       |
|           | Arsenic (As)    | mg/kg | 17                   | 5.9                         | 3.53 ± 1.09            | 4.82                    | 3.47                    | 4.07 ± 0.397           | 3.09 ± 0.43                     |
|           | Barium (Ba)     | mg/kg | -                    | -                           | 117 ± 22.0             | 79.2                    | 104                     | 122 ± 18.3             | 86.3 ± 7.97                     |
|           | Beryllium (Be)  | mg/kg | -                    | -                           | 0.65 ± 0.073           | 0.72                    | 1.33                    | 0.80 ± 0.092           | 1.02 ± 0.10                     |
|           | Bismuth (Bi)    | mg/kg | -                    | -                           | <0.20 ± 0              | <0.20                   | 0.23                    | <0.20 ± 0              | 0.24 ± 0.0092                   |
|           | Boron (B)       | mg/kg | -                    | -                           | 12.2 ± 0.853           | 18.9                    | 43.9                    | 14.7 ± 1.77            | 30.1 ± 2.29                     |
|           | Cadmium (Cd)    | mg/kg | 3.5                  | 1.5                         | 0.173 ± 0.047          | 0.108                   | 0.145                   | 0.148 ± 0.0172         | 0.138 ± 0.0117                  |
|           | Calcium (Ca)    | mg/kg | -                    | -                           | 5,608 ± 1,247          | 7,720                   | 5,310                   | 5,010 ± 407            | 4,213 ± 662                     |
|           | Chromium (Cr)   | mg/kg | 90                   | 98                          | 54.3 ± 4.40            | 60.6                    | 94.1                    | 65.0 ± 6.64            | 79.6 ± 7.46                     |
|           | Cobalt (Co)     | mg/kg | -                    | -                           | 10.8 ± 1.64            | 14.0                    | 18.7                    | 15.2 ± 1.56            | 15.8 ± 1.30                     |
|           | Copper (Cu)     | mg/kg | 110                  | 50                          | <b>71.4</b> ± 14.2     | 27.8                    | 36.0                    | <b>83.8</b> ± 11.1     | 31.3 ± 3.16                     |
|           | Iron (Fe)       | mg/kg | 40,000 <sup>α</sup>  | 52,400                      | 50,600 ± 24,939        | 34,500                  | 46,600                  | 45,080 ± 4,440         | 39,013 ± 3,068                  |
|           | Lead (Pb)       | mg/kg | 91.3                 | 35                          | 13.8 ± 0.799           | 14.5                    | 25.5                    | 16.7 ± 1.82            | 20.6 ± 2.15                     |
|           | Lithium (Li)    | mg/kg | -                    | -                           | 26.0 ± 2.51            | 29.2                    | 50.7                    | 33.7 ± 3.83            | 39.5 ± 4.06                     |
|           | Magnesium (Mg)  | mg/kg | -                    | -                           | 11,440 ± 814           | 14,500                  | 18,700                  | 14,180 ± 1,422         | 15,421 ± 1,463                  |
|           | Manganese (Mn)  | mg/kg | 1,100 <sup>α,β</sup> | 4,370                       | 579 ± 258              | 1,350                   | 778                     | 1,230 ± 355            | 1,693 ± 268                     |
|           | Mercury (Hg)    | mg/kg | 0.486                | 0.170                       | 0.0500 ± 0.0178        | 0.0293                  | 0.0541                  | 0.0583 ± 0.0164        | 0.0527 ± 0.0074                 |
|           | Molybdenum (Mo) | mg/kg | -                    | -                           | 4.4 ± 3.31             | 0.52                    | 0.92                    | 2.52 ± 0.273           | 0.98 ± 0.14                     |
|           | Nickel (Ni)     | mg/kg | 75 <sup>α,β</sup>    | 72                          | 40.0 ± 3.52            | 51.7                    | 62.0                    | 45.0 ± 4.54            | 57.8 ± 5.11                     |
|           | Phosphorus (P)  | mg/kg | 2,000 <sup>α</sup>   | 1,580                       | 1,167 ± 394            | 1,100                   | 849                     | 956 ± 47               | 855 ± 82                        |
|           | Potassium (K)   | mg/kg | -                    | -                           | 4,100 ± 453            | 3,470                   | 7,650                   | 5,338 ± 543            | 5,685 ± 579                     |
|           | Selenium (Se)   | mg/kg | -                    | -                           | 0.73 ± 0.31            | <0.20                   | 0.26                    | 0.61 ± 0.18            | 0.24 ± 0.008                    |
|           | Silver (Ag)     | mg/kg | -                    | -                           | 0.14 ± 0.047           | <0.10                   | 0.16                    | 0.20 ± 0.057           | 0.15 ± 0.0104                   |
|           | Sodium (Na)     | mg/kg | -                    | -                           | 304 ± 32               | 238                     | 453                     | 369 ± 50               | 354 ± 35                        |
|           | Strontium (Sr)  | mg/kg | -                    | -                           | 11.6 ± 1.70            | 11.1                    | 16.7                    | 12.3 ± 1.24            | 13.5 ± 1.18                     |
|           | Sulphur (S)     | mg/kg | -                    | -                           | 1,400 ± 387            | <1,000                  | <1,000                  | 1,140 ± 195            | <1,000 ± 0                      |
|           | Thallium (Tl)   | mg/kg | -                    | -                           | 0.379 ± 0.0415         | 0.298                   | 0.603                   | 0.594 ± 0.094          | 0.461 ± 0.0472                  |
|           | Tin (Sn)        | mg/kg | -                    | -                           | <2.0 ± 0               | <2.0                    | <2.0                    | <2.0 ± 0               | <2.0 ± 0                        |
|           | Titanium (Ti)   | mg/kg | -                    | -                           | 1,006 ± 109            | 978                     | 1,970                   | 1,136 ± 50             | 1,466 ± 142                     |
|           | Uranium (U)     | mg/kg | -                    | -                           | 11.0 ± 2.41            | 3.35                    | 8.48                    | 19.7 ± 3.76            | 7.13 ± 0.771                    |
|           | Vanadium (V)    | mg/kg | -                    | -                           | 54.1 ± 5.40            | 48.0                    | 78.6                    | 63.4 ± 4.89            | 61.7 ± 5.63                     |
|           | Zinc (Zn)       | mg/kg | 315                  | 135                         | 73.1 ± 7.83            | 48.1                    | 86.2                    | 83.8 ± 8.52            | 67.4 ± 6.56                     |
|           | Zirconium (Zr)  | mg/kg | -                    | -                           | 4.5 ± 1.0              | 10.4                    | 25.9                    | 3.9 ± 0.32             | 20.4 ± 2.7                      |

Indicates parameter concentration above SQG.

**BOLD** Indicates parameter concentration above the AEMP Benchmark.

Notes: TOC = total organic carbon. SQG = sediment quality guideline. n = number of samples. SD = standard deviation.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013). The indicated values are specific to Mary Lake.

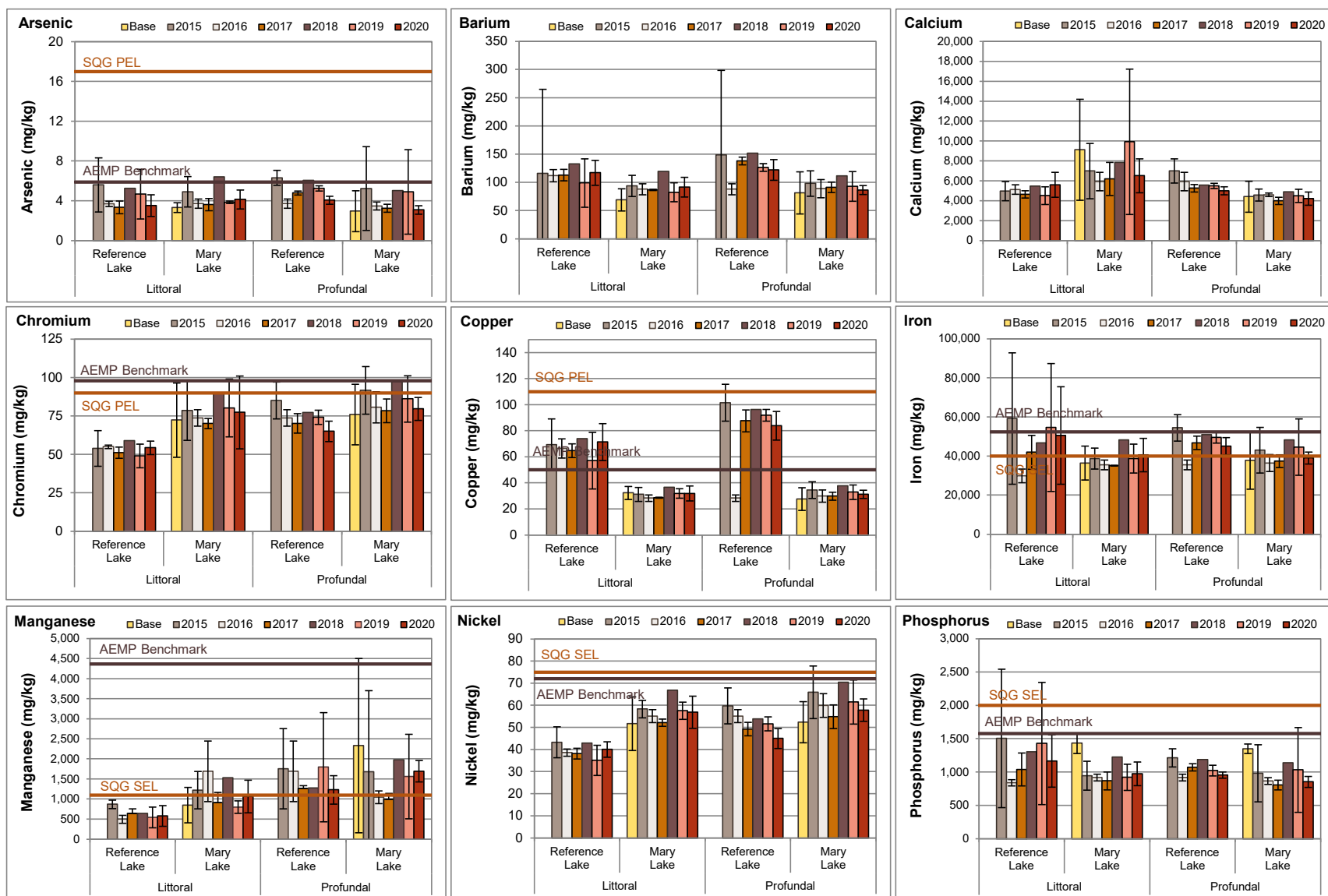


**Figure 5.9: Temporal Comparison of Sediment Metal Concentrations (mean  $\pm$  SD) at Littoral and Profundal Stations of Mary Lake and Reference Lake 3 for Mine Baseline (2005 to 2013) and Operational (2015 to 2020) Periods**

### 5.3.3 Phytoplankton

Chlorophyll-a concentrations at Mary Lake showed no spatial gradients with distance from either the Tom River inlet or the Mary River inlet towards the lake outlet during any of the winter, summer, or fall sampling events in 2020 (Figure 5.10). Chlorophyll-a concentrations were typically lowest in winter and highest in summer at both the north and south basins of Mary Lake (Figure 5.10). Chlorophyll-a concentrations at the Mary Lake north basin did not differ significantly from those at Reference Lake 3 in fall and summer, or between the Mary Lake south basin and Reference Lake 3 in the fall sampling event, but concentrations at the south basin were significantly higher than at the reference lake at the time of the summer sampling event (Appendix Tables E.7 and E.8). Chlorophyll-a concentrations at the Mary Lake north and south basins were well below the AEMP benchmark of 3.7 µg/L during all winter, summer, and fall sampling events in 2020 (Figure 5.10) and reflected an 'oligotrophic' primary productivity categorization based on Wetzel (2001) classification. This oligotrophic categorization agreed with CWQG trophic status classification that is based on average aqueous total phosphorus concentrations below 10 µg/L (Table 5.7; Appendix Tables C.68 and C.72).

Temporal comparison of Mary Lake chlorophyll-a concentrations, conducted separately for the north and south basins, did not indicate any consistent direction of significant differences between the 2019 data and data from the mine construction (2014) period or previous years of mine operation (2015 to 2019) during any of the winter, summer, or fall seasons (Figure 5.11; Appendix Figure E.1). In addition, annual average chlorophyll-a concentrations have not shown any consistent direction of change (i.e., increase or decrease) over time since the mine was constructed in 2014 (Figure 5.11; Appendix Figure E.1) suggesting no substantial changes in the trophic status of the lake since mine operations commenced at the Mary River Project. No chlorophyll-a baseline (2005 to 2013) data are available for Mary Lake, precluding comparisons to conditions prior to mine construction.

### 5.3.4 Benthic Invertebrate Community

Benthic invertebrate density, richness, and evenness at littoral and profundal habitat of Mary Lake did not differ significantly compared to like-habitat stations at Reference Lake 3 in 2020 (Tables 5.9 and 5.10). Benthic invertebrate community compositional differences were indicated between Mary Lake and Reference Lake 3 based on significantly differing Bray-Curtis Index for both littoral and profundal habitat types (Appendix Table F.21), but no significant differences in dominant taxonomic groups were indicated between Mary Lake and the reference lake for either habitat (Tables 5.9 and 5.10). Rather, significantly lower relative abundance of the filterer FFG and the clinger HPG at Mary Lake littoral and profundal stations compared to like-habitat stations at Reference Lake 3 (Tables 5.9 and 5.10) suggested that differences in the community



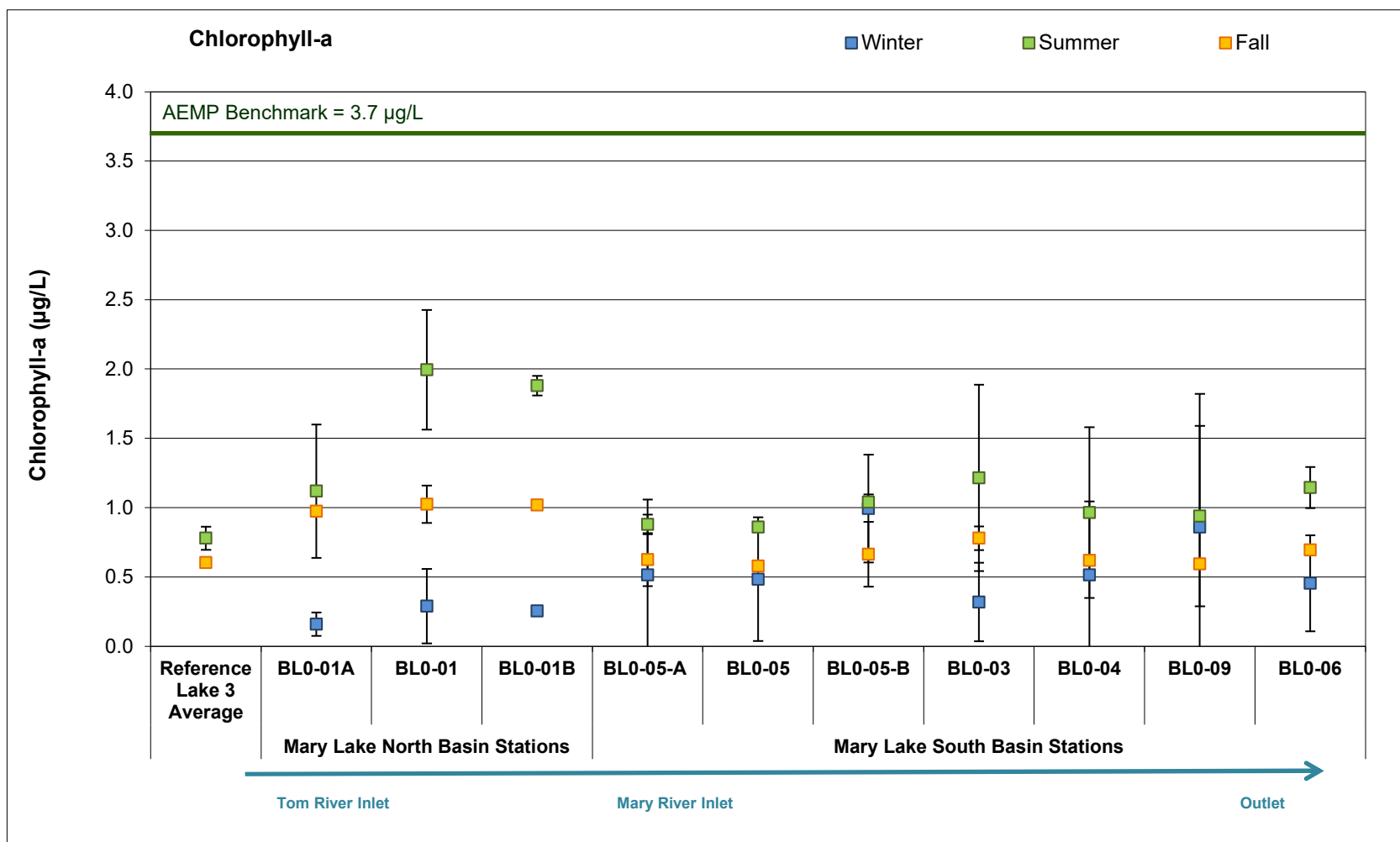


**Figure 5.10: Chlorophyll-a Concentrations at Mary Lake (BLO) Phytoplankton Monitoring Stations, Mary River Project CREMP, 2020**

Notes: Values presented are averages of samples taken from the surface and the bottom of the water column at each station. Reference lake values represent mean  $\pm$  standard deviation ( $n = 3$ ). Reference Lake 3 was not sampled in winter 2020.

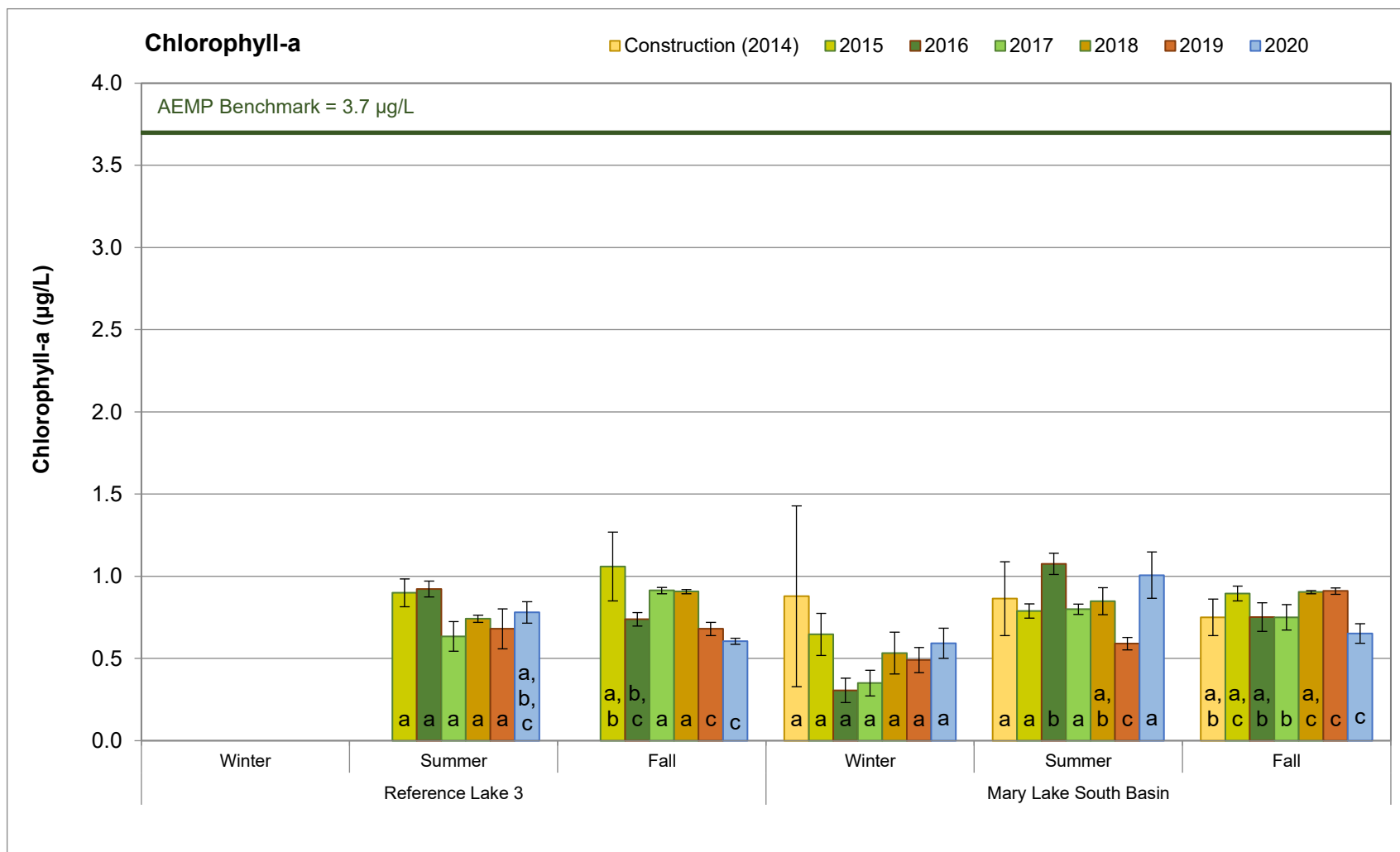


**Figure 5.11: Temporal Comparison of Chlorophyll-a Concentrations Among Seasons between the Mary Lake South Basin and Reference Lake 3 for Mine Construction (2014) and Operational (2015 to 2020) Periods (mean  $\pm$  SE)**

Note: Bars with the same letter at the base do not differ significantly between years for the applicable season.

**Table 5.9: Benthic Invertebrate Community Statistical Comparison Results between Mary Lake (BLO) and Reference Lake 3 for Littoral Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics          |       |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|-----------------------------|-------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Littoral Habitat | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | tunequal                 | log10               | NO                                    | 0.401   | 5.8                                              | Reference Lake 3            | 1,571 | 430                | 193            | 1,190   | 1,474  | 2,310   |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 4,086 | 3,955              | 1,978          | 966     | 3,017  | 9,345   |
| Richness (Number of Taxa)             | t-unequal                | log10               | NO                                    | 0.244   | -1.2                                             | Reference Lake 3            | 14.6  | 2.5                | 1.1            | 13.0    | 14.0   | 19.0    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 11.5  | 4.2                | 2.1            | 7.0     | 11.5   | 16.0    |
| Simpson's Evenness (E)                | t-equal                  | none                | NO                                    | 0.464   | -0.4                                             | Reference Lake 3            | 0.810 | 0.110              | 0.049          | 0.630   | 0.847  | 0.923   |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 0.765 | 0.041              | 0.021          | 0.707   | 0.775  | 0.802   |
| Hydracarina (%)                       | t-equal                  | log10               | NO                                    | 0.241   | -0.6                                             | Reference Lake 3            | 5.3   | 2.6                | 1.2            | 3.5     | 4.4    | 9.9     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 3.7   | 2.9                | 1.4            | 1.7     | 2.7    | 7.8     |
| Ostracoda (%)                         | t-equal                  | log10               | NO                                    | 0.606   | 0.3                                              | Reference Lake 3            | 37.9  | 14.5               | 6.5            | 26.7    | 36.2   | 62.6    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 42.7  | 12.7               | 6.4            | 23.8    | 48.2   | 50.7    |
| Chironomidae (%)                      | t-equal                  | none                | NO                                    | 0.987   | 0.0                                              | Reference Lake 3            | 52.6  | 15.6               | 7.0            | 26.9    | 59.0   | 66.4    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 52.5  | 14.7               | 7.4            | 43.8    | 45.8   | 74.4    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | YES                                   | 0.008   | -2.2                                             | Reference Lake 3            | 28.8  | 9.5                | 4.3            | 15.6    | 32.5   | 38.7    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 8.1   | 6.6                | 3.3            | 3.9     | 5.2    | 17.9    |
| Collector-Gatherers (%)               | t-equal                  | none                | NO                                    | 0.661   | 0.5                                              | Reference Lake 3            | 63.1  | 11.4               | 5.1            | 53.6    | 60.3   | 81.5    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 68.8  | 24.9               | 12.5           | 34.5    | 73.2   | 94.1    |
| Filterers (%)                         | t-equal                  | log10(x+1)          | YES                                   | 0.009   | -2.2                                             | Reference Lake 3            | 27.1  | 9.8                | 4.4            | 14.4    | 29.2   | 38.0    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 5.5   | 8.3                | 4.2            | 0.0     | 2.1    | 17.6    |
| Shredders (%)                         | t-unequal                | none                | YES                                   | 0.064   | -1.1                                             | Reference Lake 3            | 3.9   | 3.3                | 1.5            | 0.6     | 3.2    | 7.4     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 0.1   | 0.2                | 0.1            | 0.0     | 0.0    | 0.4     |
| Clingers (%)                          | t-equal                  | log10               | YES                                   | 0.004   | -2.5                                             | Reference Lake 3            | 31.9  | 9.3                | 4.2            | 17.9    | 33.5   | 41.6    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 8.7   | 6.2                | 3.1            | 3.6     | 6.8    | 17.6    |
| Sprawlers (%)                         | t-equal                  | log10               | YES                                   | 0.033   | 1.9                                              | Reference Lake 3            | 57.9  | 12.1               | 5.4            | 41.0    | 57.2   | 73.8    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 80.7  | 11.8               | 5.9            | 65.6    | 83.6   | 90.2    |
| Burrowers (%)                         | t-equal                  | log10               | NO                                    | 0.582   | 0.1                                              | Reference Lake 3            | 10.2  | 4.9                | 2.2            | 4.6     | 8.3    | 17.3    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Littoral          | 10.6  | 12.1               | 6.1            | 2.3     | 5.7    | 28.5    |

Grey shading indicates statistically significant difference between study areas based on p-value  $\leq 0.10$ .

Blue shaded values indicate significant difference (p-value  $\leq 0.10$ ) that was also outside of a CES of  $\pm 2 SD_{REF}$ , indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.



**Table 5.10: Benthic Invertebrate Community Statistical Comparison Results between Mary Lake (BLO) and Reference Lake 3 for Profundal Habitat Stations, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics           |       |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|------------------------------|-------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Study Lake Profundal Habitat | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | NO                                    | 0.308   | 2.1                                              | Reference Lake 3             | 479   | 142                | 63             | 336     | 491    | 681     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 779   | 452                | 184            | 216     | 625    | 1,362   |
| Richness (Number of Taxa)             | t-equal                  | log10               | NO                                    | 0.814   | 0.3                                              | Reference Lake 3             | 7.0   | 1.9                | 0.8            | 5.0     | 8.0    | 9.0     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 7.5   | 2.8                | 1.2            | 5.0     | 6.0    | 12.0    |
| Simpson's Evenness (E )               | t-unequal                | none                | NO                                    | 0.140   | -3.2                                             | Reference Lake 3             | 0.731 | 0.045              | 0.020          | 0.689   | 0.721  | 0.795   |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 0.586 | 0.201              | 0.082          | 0.322   | 0.564  | 0.834   |
| Hydracarina (%)                       | t-equal                  | log10(x+1)          | NO                                    | 0.166   | 0.9                                              | Reference Lake 3             | 2.8   | 2.0                | 0.9            | 0.0     | 3.5    | 5.1     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 4.7   | 2.1                | 0.9            | 2.5     | 4.3    | 8.0     |
| Ostracoda (%)                         | t-unequal                | log10               | NO                                    | 0.810   | 3.6                                              | Reference Lake 3             | 8.6   | 4.1                | 1.8            | 3.5     | 7.7    | 14.5    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 23.4  | 28.9               | 11.8           | 1.3     | 14.2   | 76.0    |
| Chironomidae (%)                      | Mann Whitney             | rank                | NO                                    | 0.792   | -4.0                                             | Reference Lake 3             | 87.9  | 4.2                | 1.9            | 82.3    | 87.2   | 92.7    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 71.3  | 30.2               | 12.3           | 16.0    | 80.5   | 94.6    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | YES                                   | 0.007   | -1.5                                             | Reference Lake 3             | 31.5  | 17.6               | 7.9            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 5.6   | 5.2                | 2.1            | 0.0     | 4.1    | 14.7    |
| Collector-Gatherers (%)               | t-equal                  | none                | YES                                   | 0.006   | 1.6                                              | Reference Lake 3             | 62.9  | 15.0               | 6.7            | 45.4    | 56.1   | 79.0    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 86.6  | 5.9                | 2.4            | 76.3    | 87.7   | 92.1    |
| Filterers (%)                         | t-equal                  | log10(x+1)          | YES                                   | 0.004   | -1.6                                             | Reference Lake 3             | 30.7  | 17.5               | 7.8            | 7.9     | 38.0   | 49.3    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 3.2   | 5.3                | 2.2            | 0.0     | 0.7    | 13.6    |
| Shredders (%)                         | t-equal                  | log10(x+1)          | NO                                    | 0.261   | -0.7                                             | Reference Lake 3             | 2.2   | 2.3                | 1.0            | 0.0     | 2.5    | 5.3     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 0.8   | 1.9                | 0.8            | 0.0     | 0.0    | 4.5     |
| Clingers (%)                          | t-equal                  | log10               | YES                                   | 0.036   | -1.2                                             | Reference Lake 3             | 33.5  | 16.9               | 7.6            | 13.1    | 41.5   | 52.8    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 12.5  | 11.1               | 4.5            | 2.7     | 9.1    | 32.0    |
| Sprawlers (%)                         | Mann Whitney             | rank                | NO                                    | 0.177   | 0.7                                              | Reference Lake 3             | 64.8  | 16.2               | 7.2            | 45.5    | 58.5   | 87.0    |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 75.5  | 32.9               | 13.4           | 9.3     | 88.5   | 93.8    |
| Burrowers (%)                         | Mann Whitney             | rank                | NO                                    | 0.191   | 3.6                                              | Reference Lake 3             | 1.7   | 2.9                | 1.3            | 0.0     | 0.0    | 6.7     |
|                                       |                          |                     |                                       |         |                                                  | Mary Lake Profundal          | 12.0  | 23.0               | 9.4            | 0.0     | 3.4    | 58.7    |

Grey shading indicates statistically significant difference between study areas based on p-value ≤ 0.10.

Blue shaded values indicate significant difference (p-value ≤ 0.10) that was also outside of a CES of ±2 SD<sub>REF</sub>, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

between lakes reflected slight differences in dominant food resources available to benthic invertebrates and/or physical habitat features, respectively. Although the relative abundance of metal-sensitive Chironomidae was significantly lower at Mary Lake than at Reference Lake 3 (Tables 5.9 and 5.10), metal concentrations in water and sediment of Mary Lake were comparable to those at the reference lake (Tables 5.7 and 5.8), suggesting that differences in benthic invertebrate community features between lakes were not related to metal concentrations.

No significant differences in benthic invertebrate density, richness, evenness, relative abundance of dominant groups, and relative abundance of FFG were shown consistently at Mary Lake littoral and profundal habitat over years of mine operation (2015 to 2020) compared to baseline (Appendix Figures F.15 and F.16; Appendix Tables F.61 and F.62). In addition, no significant differences in the relative abundance of metal-sensitive Chironomidae were indicated for years of mine-operation relative to baseline (Appendix Tables F.61 and F.62), indicating that the differences in the relative abundance of this group between Mary Lake and Reference Lake 3 in 2020 likely reflected natural variability. Therefore, consistent with no substantial changes in water and sediment quality since the mine baseline period, no ecologically significant changes in benthic invertebrate community features were indicated at littoral and profundal habitat of Mary Lake since the commencement of commercial mine operation in 2015.

### **5.3.5 Fish Population**

#### **5.3.5.1 Mary Lake (South) Fish Community**

Arctic charr and ninespine stickleback were captured in Mary Lake in 2020 (Table 5.6), consistent with the previous five years of sampling (Minnow 2020). Electrofishing and gill netting CPUE were each higher at Mary Lake than at Reference Lake 3 (Table 5.11), suggesting greater densities and/or productivity of both arctic charr and ninespine stickleback at Mary Lake. Consistent with the other mine-exposed lakes, greater numbers of arctic charr together with greater density of benthic invertebrates suggested that overall biological productivity was higher at Mary Lake than at Reference Lake 3. Arctic charr CPUE associated with electrofishing in 2020 at Mary Lake was comparable to highest CPUE from other years of mine operation and substantially greater than baseline monitoring conducted in 2008 (Figure 5.12). Gill netting CPUE at Mary Lake in 2020 was within the range of observed during previous years of mine operation (2015 to 2019), and also greater than CPUE during baseline (2006 and 2007; Figure 5.12). Based on the CPUE data, arctic charr abundances at nearshore and littoral/profundal habitats of Mary Lake were likely comparable to or greater than during the baseline period, indicating no mine-related influences on arctic charr abundance in the lake.



**Table 5.11: Fish Catch and Community Summary from Backpack Electrofishing and Gill Netting Conducted at Mary Lake (BLO) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

| Lake             | Method <sup>a</sup> |            | Arctic Charr | Ninespine Stickleback | Total by Method | Total No. of Species |
|------------------|---------------------|------------|--------------|-----------------------|-----------------|----------------------|
| Reference Lake 3 | Electrofishing      | No. Caught | 134          | 1                     | 135             | 2                    |
|                  |                     | CPUE       | 2.09         | 0.016                 | 2.11            |                      |
|                  | Gill netting        | No. Caught | 69           | 0                     | 69              |                      |
|                  |                     | CPUE       | 0.956        | 0                     | 0.956           |                      |
| Mary Lake        | Electrofishing      | No. Caught | 105          | 26                    | 131             | 2                    |
|                  |                     | CPUE       | 3.01         | 0.746                 | 3.76            |                      |
|                  | Gill netting        | No. Caught | 94           | 0                     | 94              |                      |
|                  |                     | CPUE       | 4.60         | 0                     | 4.60            |                      |

<sup>a</sup> Catch-per-unit-effort (CPUE) for electrofishing represents the number of fish captured per electrofishing minute, and for gill netting represents the number of fish captured per 100 m hours of net.

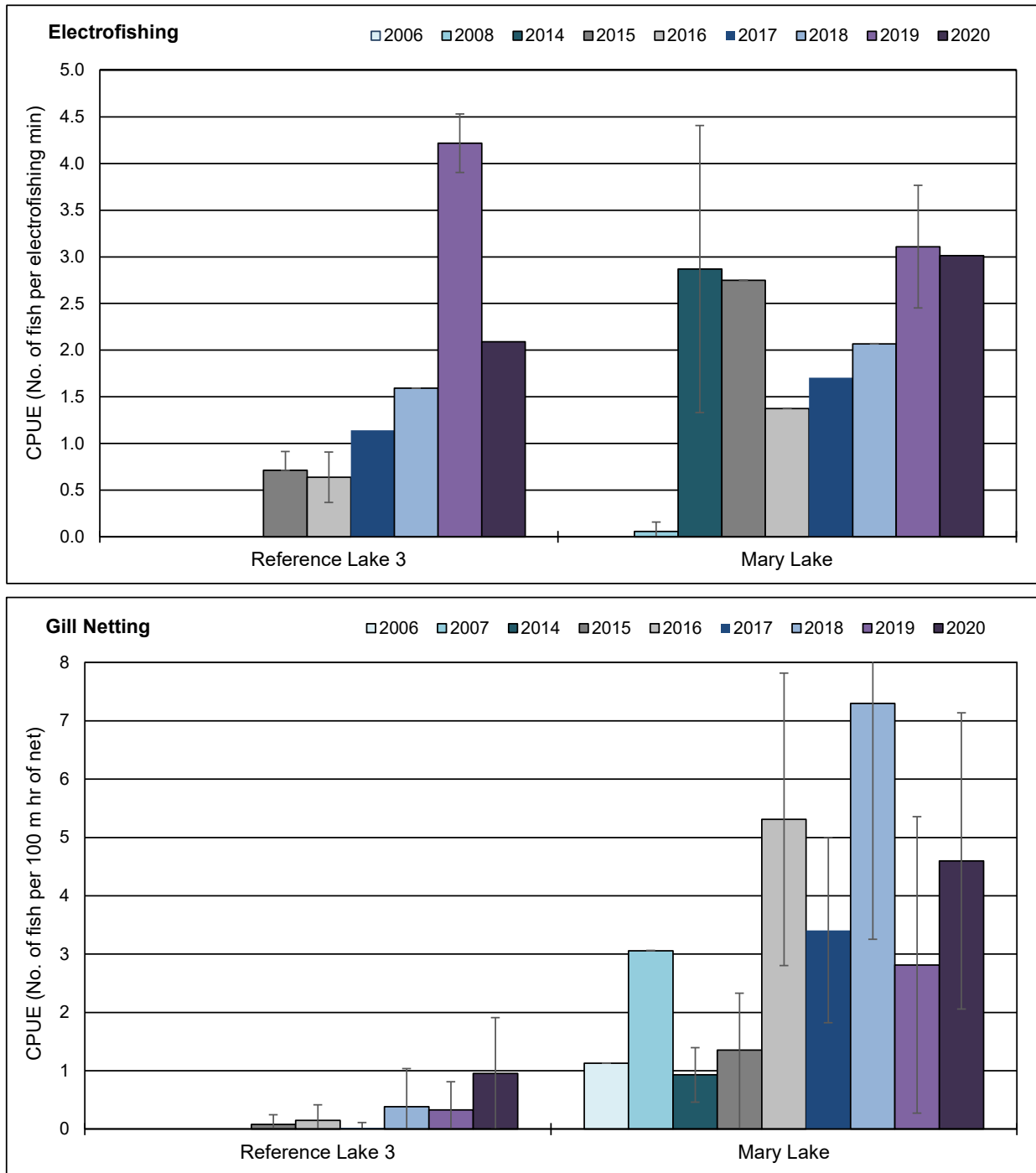


**Figure 5.12: Catch-per-unit-effort (CPUE; mean  $\pm$  SD) of Arctic Charr Captured by Back-pack Electrofishing and Gill Netting at Mary Lake (BLO), Mary River Project CREMP, 2006 to 2020**

Note: Data presented for fish sampling conducted in fall during baseline (2006, 2007), construction (2014), and operational (2015 to 2020) mine phases.

### 5.3.5.2 Mary Lake (South) Fish Population Assessment

#### Nearshore Arctic Charr

A total of 100 arctic charr were captured from nearshore habitats in each of Mary Lake and Reference Lake 3 in August 2020. Arctic charr YOY were distinguished from non-YOY using fork length cut-offs of 4.1 cm and 4.3 cm for the Mary Lake and Reference Lake 3 data sets, respectively, based on evaluation of length-frequency distributions coupled with supporting age determinations (Figure 5.13; Appendix Tables G.4 and G.25). However, due to small sample sizes of nearshore arctic charr YOY at Mary Lake (i.e., only two individuals), statistical comparisons of fish health endpoints were conducted using the non-YOY population only. Arctic charr of nearshore habitat showed differing length-frequency distributions between Mary Lake and Reference Lake 3, reflecting fewer YOY and a more limited size distribution of fish at Mary Lake compared to the reference lake (Table 5.12; Figure 5.13; Appendix Table G.26). Arctic charr non-YOY from Mary Lake were similar in size to reference lake fish, and although condition of non-YOY was significantly greater at Mary Lake than at the reference lake, the magnitude of this difference was well within the  $CES_C$  of  $\pm 10\%$  indicating that this difference was not ecologically meaningful (Table 5.12; Appendix Table G.26). No consistent differences in size or condition of non-YOY arctic charr from nearshore habitat of Mary Lake relative were indicated relative to the reference lake from 2015 to 2020, suggesting that differences between lakes over time reflected natural variability (Table 5.12). No nearshore arctic charr baseline data were collected at Mary Lake, precluding data analysis using a before-after design. Collectively, the data indicated no adverse effects on arctic charr from nearshore areas in Mary Lake since the commencement of mine operations in 2015.

#### Littoral/Profundal Arctic Charr

A total of 94 and 69 arctic charr were sampled from littoral/profundal habitat of Mary Lake and Reference Lake 3, respectively, in August 2020. The length-frequency distribution for littoral/profundal arctic charr differed significantly between lakes due to a greater number of larger fish being caught at Mary Lake (Table 5.12; Figure 5.13; Appendix Table G.30). Arctic charr sampled from littoral/profundal habitat of Mary Lake were also significantly longer, heavier, and of greater condition than those from Reference Lake 3 in 2020 (Table 5.12; Appendix Table G.30). The absolute magnitude of difference in body condition was greater than the  $CES_C$  of 10%, suggesting that this difference may be ecologically significant (Table 5.12; Appendix Table G.30). An on-going significant difference in length-frequency distribution was the only consistent difference shown for arctic charr captured from littoral/profundal habitat of Mary Lake from 2015 to 2020 compared to the reference lake data for the same period and Mary Lake baseline data (Table 5.12; Appendix Table G.30). No consistent differences in arctic charr size and condition



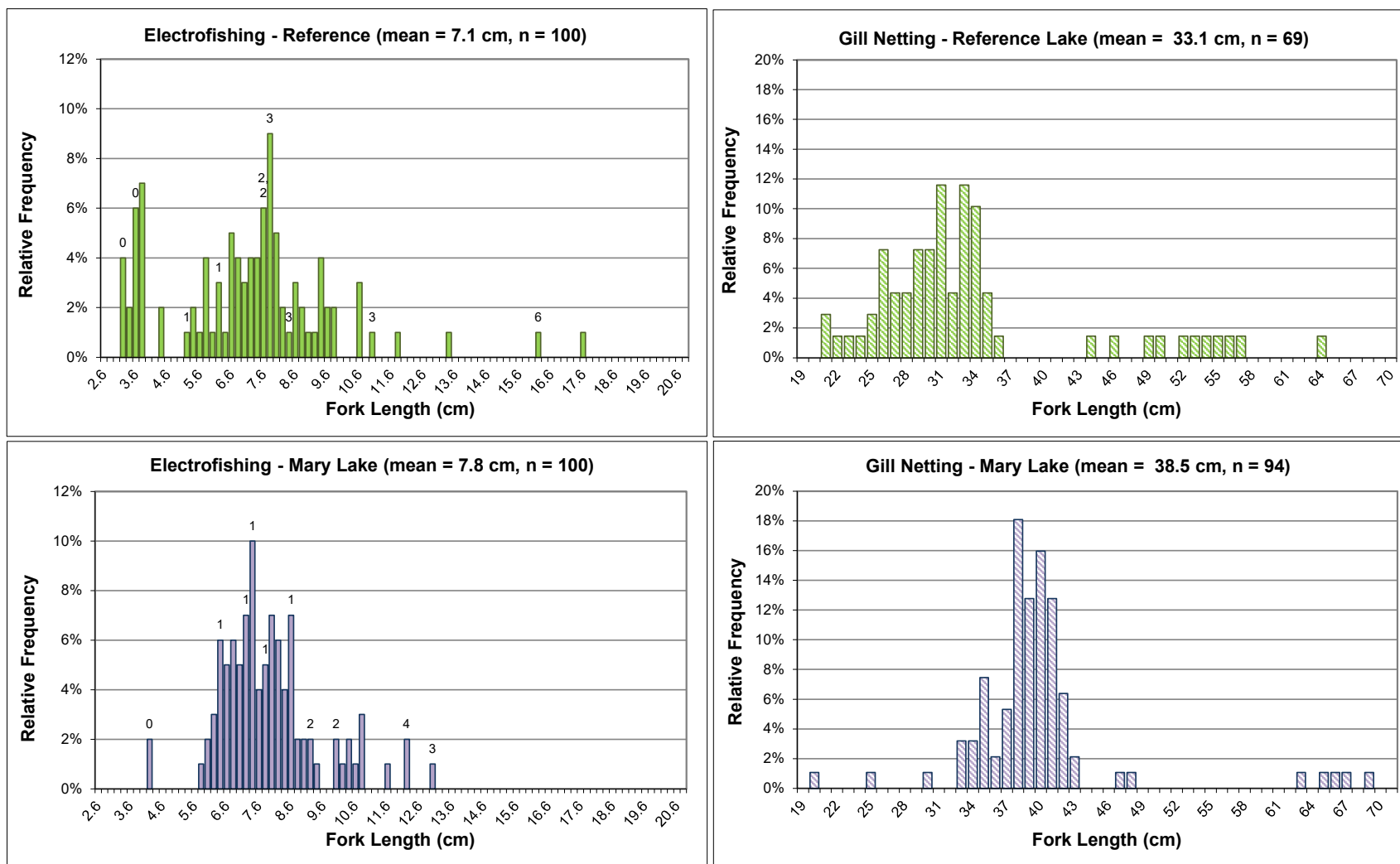


**Figure 5.13: Length-Frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Mary Lake (BLO) and Reference Lake 3 (REF3), Mary River Project CREMP, August 2020**

Note: Fish ages are shown above the bars, where available

**Table 5.12: Summary of Statistical Results for Arctic Charr Population Comparisons between Mary Lake and Reference Lake 3 from 2015 to 2020, and between Mary Lake Mine Operational and Baseline Period Data, for Fish Captured by Electrofishing and Gill Netting Methods**

| Data Set by Sampling Method       | Response Category        | Endpoint                               | Statistically Significant Differences Observed? <sup>a</sup> |      |            |            |            |             |                                                    |            |           |           |            |            |
|-----------------------------------|--------------------------|----------------------------------------|--------------------------------------------------------------|------|------------|------------|------------|-------------|----------------------------------------------------|------------|-----------|-----------|------------|------------|
|                                   |                          |                                        | versus Reference Lake 3                                      |      |            |            |            |             | versus Mary Lake baseline period data <sup>b</sup> |            |           |           |            |            |
|                                   |                          |                                        | 2015                                                         | 2016 | 2017       | 2018       | 2019       | 2020        | 2015                                               | 2016       | 2017      | 2018      | 2019       | 2020       |
| Electrofishing Samples            | Survival                 | Length-Frequency Distribution          | No                                                           | Yes  | Yes        | Yes        | Yes        | Yes (-27%)  | -                                                  | -          | -         | -         | -          | -          |
|                                   |                          | Age                                    | Yes (-43%)                                                   | No   | No         | -          | -          | -           | -                                                  | -          | -         | -         | -          | -          |
|                                   | Energy Use (non-YOY)     | Size (mean fork length)                | No                                                           | No   | Yes (+17%) | Yes (+10%) | Yes (-27%) | No          | -                                                  | -          | -         | -         | -          | -          |
|                                   |                          | Size (mean weight)                     | No                                                           | No   | Yes (+51%) | No         | Yes (-61%) | No          | -                                                  | -          | -         | -         | -          | -          |
|                                   | Energy Storage (non-YOY) | Condition (body weight-at-fork length) | Yes (+3%)                                                    | No   | No         | Yes (-8%)  | Yes (+4%)  | Yes (+2.6%) | -                                                  | -          | -         | -         | -          | -          |
| Gill Netting Samples <sup>c</sup> | Survival                 | Length Frequency Distribution          | -                                                            | -    | -          | Yes        | Yes        | Yes (-64%)  | Yes                                                | Yes        | Yes       | Yes       | Yes        | Yes (+21%) |
|                                   |                          | Age                                    | -                                                            | -    | -          | -          | -          | -           | No                                                 | Yes (-14%) | No        | -         | -          | -          |
|                                   | Energy Use               | Size (mean fork length)                | -                                                            | -    | -          | Yes (+12%) | Yes (+24%) | Yes (+23%)  | Yes (+6%)                                          | No         | Yes (-5%) | No        | Yes (-4%)  | No         |
|                                   |                          | Size (mean weight)                     | -                                                            | -    | -          | Yes (+51%) | Yes (+96%) | Yes (+118%) | Yes (+19%)                                         | No         | Yes (-9%) | No        | Yes (-14%) | No         |
|                                   |                          | Growth (fork length-at-age)            | -                                                            | -    | -          | -          | -          | -           | No                                                 | Yes (nc)   | No        | -         | -          | -          |
|                                   |                          | Growth (weight-at-age)                 | -                                                            | -    | -          | -          | -          | -           | No                                                 | Yes (nc)   | No        | -         | -          | -          |
|                                   | Energy Storage           | Condition (body weight-at-fork length) | -                                                            | -    | -          | Yes (+3%)  | Yes (+3%)  | Yes (+14%)  | No                                                 | Yes (+3%)  | Yes (+5%) | Yes (-3%) | Yes (-5%)  | No         |

**BOLD** indicates a significant difference related to the comparison.

<sup>a</sup> Values in parentheses indicate direction and magnitude of any significant differences.

<sup>b</sup> No baseline period data collected for nearshore electrofishing; baseline period littoral/profundal gill netting data included combined 2006 and 2007 information.

<sup>c</sup> Due to low catches of arctic charr in gill nets at Reference Lake 3 in 2015, 2016, and 2017, no comparison of fish health was conducted for gill netted fish.



endpoints for fish captured at littoral/profundal habitat of Mary Lake have occurred from 2015 to 2020 compared to baseline (Table 5.12). This suggested that natural and/or sampling variability likely accounted for the variable differences in arctic charr health endpoints between years of mine operation and baseline at Mary Lake.

### 5.3.6 Effects Assessment and Recommendations

At Mary Lake, the following AEMP benchmark was exceeded in 2020:

- Manganese concentration in sediment was greater than the benchmark of 4,370 mg/kg at one profundal monitoring station (BL0-09), although the average concentration of manganese in sediment at profundal stations was below this benchmark.

The AEMP benchmarks for sediment quality were exceeded only at a single profundal station and only for a single parameter (manganese) at Mary Lake in 2020. The isolated occurrence of this exceedance, and the fact that average manganese concentrations in sediment at Mary Lake were not particularly elevated compared to concentrations at the reference lake or to those at Mary Lake during baseline, indicated no mine-related change in manganese concentrations at Mary Lake since commercial mine operations commenced in 2015. No AEMP benchmarks for water quality were exceeded over the duration of spring, summer, and fall sampling events in 2020 at Mary Lake. In addition, no adverse effects on phytoplankton, benthic invertebrates, nor on fish (arctic charr) health were indicated at Mary Lake in 2020 based on comparisons to reference lake conditions and to Mary Lake baseline data. Under the Mary River Project AEMP Management Response Framework, the absence of a mine-related change in AEMP benchmark parameters over time (or compared to background) requires no further management response (Figure 2.8). Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no management response (i.e., alteration of existing AEMP) is required for Mary Lake as part of the next monitoring program.



## 6 CONCLUSIONS

### 6.1 Overview

The objective of the Mary River Project 2020 CREMP was to evaluate potential mine-related influences on chemical and biological conditions at aquatic environments located near the mine following the sixth full year of mine operation. The CREMP employs an effects-based approach that includes standard environmental effects monitoring (EEM) techniques that were conducted as the basis for determining potential mine-related effects at key receiving waterbodies. Under this approach, water quality and sediment quality data were used to support the interpretation of phytoplankton, benthic invertebrate community, and fish population survey data collected at mine-exposed areas of the Camp Lake, Sheardown Lake, Mary River and Mary Lake systems. The evaluation of potential mine-related effects within these systems was based upon comparisons of the 2020 data to applicable reference data, baseline data, and to guidelines that included site-specific AEMP benchmarks. The latter were developed to guide management response decisions within a four-step Management Response Framework as outlined in the Mary River Project AEMP (Baffinland 2015). An effects determination was conducted for all key waterbodies located within each of the Camp Lake, Sheardown Lake, Mary River, and Mary Lake systems, which was based on weight-of-evidence that considered incidences in which the AEMP benchmarks were exceeded and a commensurate adverse influence on aquatic biota occurred. Where appropriate, recommendations for future study were provided to assist Baffinland with decisions regarding appropriate management actions for cases in which AEMP benchmarks were not achieved. Potential mine-related effects identified in the 2020 CREMP are provided separately below for the Camp, Sheardown and Mary River/Lake systems.

### 6.2 Camp Lake System

Within the Camp Lake system, AEMP monitoring is conducted at Camp Lake Tributary 1 (CLT1), Camp Lake Tributary 2 (CLT2), and Camp Lake (JL0). At CLT1, AEMP water quality benchmarks were exceeded in 2020 for copper at the north branch, and for aluminum and iron at the main stem portions of the system (Table 6.1). Copper concentrations at the CLT1 north branch were elevated compared to concentrations at reference creeks, but were comparable to those shown during baseline. Although elevated aluminum concentrations at the CLT1 main stem were not attributable to mine operations, iron concentrations at the CLT1 upper main stem in 2020 were elevated compared to those at reference creeks and to baseline suggesting a potential mine-related influence on CLT1 water quality. Metal concentrations in sediment at CLT1 were well below SQG. In addition, no adverse effects on phytoplankton (chlorophyll-a) or benthic invertebrates were indicated at CLT1 in 2020 compared to reference creek and CLT1 baseline



**Table 6.1: Summary of AEMP Benchmark Exceedances and Effects Determination for the Mary River Project 2020 CREMP and Monitoring Recommendations Based on the Results**

| Waterbody                                            | AEMP Benchmark Exceedance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Effects Determination Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Recommendation                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Camp Lake Tributary 1 (North Branch)</b>          | Aqueous total copper concentration greater than 0.0022 mg/L benchmark in spring and summer at the north branch (0.00221 mg/L and 0.00226 mg/L, respectively).                                                                                                                                                                                                                                                                                                                                                                   | Copper concentrations at the north branch were comparable to those during baseline. No adverse effects on phytoplankton or benthic invertebrates based on comparisons to reference data and to baseline data.                                                                                                                                                                                                                                                                                                                                                                                                  | Low action response includes an expanded spatial water quality sampling program to identify the source(s) of copper to the watercourse.                                                                                                                                                         |
| <b>Camp Lake Tributary 1 (Main Stem)</b>             | Aqueous total aluminum concentration greater than 0.179 mg/L benchmark in spring at upper main stem (0.270 mg/L).<br>Aqueous total iron concentration greater than 0.326 mg/L benchmark in spring, summer, and fall at upper main stem (0.420 mg/L, 0.423 mg/L, and 0.522 mg/L, respectively).                                                                                                                                                                                                                                  | Aluminum concentrations at CLT1 upper main stem were comparable to reference creeks and to baseline, and thus the change was not mine-related. Iron concentrations at CLT1 upper main stem were higher than background and reference, suggesting a mine-related change. No adverse effects on phytoplankton or benthic invertebrates based on comparisons to reference data and to baseline data at the CLT1 lower main stem.                                                                                                                                                                                  | Low action response includes establishing benthic invertebrate community monitoring stations at CLT1 upper main stem to evaluate/track effects to biota.                                                                                                                                        |
| <b>Camp Lake Tributary 2</b>                         | Water quality met all AEMP benchmarks in 2020.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | No adverse effects on phytoplankton or benthic invertebrates based on comparisons to reference data and to baseline data.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No changes recommended to monitoring program for CLT2 based on comparison to AEMP benchmarks.                                                                                                                                                                                                   |
| <b>Camp Lake</b>                                     | Sediment arsenic concentration > 5.9 mg/kg benchmark at single littoral monitoring station (9.0 mg/kg).<br>Sediment iron concentration > 52,400 mg/kg benchmark at single littoral monitoring station (61,000 mg/kg).<br>Sediment nickel concentration > 72 mg/kg benchmark at single littoral monitoring station (72.5 mg/kg).<br>Sediment arsenic, copper, iron, manganese, nickel, and phosphorus concentrations above respective benchmarks at individual stations, but below benchmarks on average, at profundal stations. | No AEMP water quality benchmarks were exceeded at Camp Lake in 2020. For all parameters except arsenic, no change in parameter concentration in sediment was shown compared to background and/or baseline, indicating the change was not mine-related. Sediment chemistry is monitored only at a single littoral station at Camp Lake under the AEMP, and thus it is unclear whether the change in arsenic concentration is mine-related (e.g., no identifiable source of arsenic). No adverse effects on phytoplankton, benthic invertebrates, or fish compared to reference data and to baseline conditions. | Low action response to harmonize lake sediment quality and benthic invertebrate monitoring stations, focusing primarily on littoral habitat, to improve the ability of the program to evaluate changes in metal concentrations in littoral sediment and to track mine-related effects to biota. |
| <b>Sheardown Lake Tributary 1</b>                    | Aqueous total copper concentration greater than 0.0022 mg/L benchmark in spring, summer, and fall (0.0029 mg/L, 0.0024, and 0.0023 mg/L, respectively).                                                                                                                                                                                                                                                                                                                                                                         | Copper concentrations at SDLT1 were comparable to those during baseline. No adverse effects on phytoplankton or benthic invertebrates based on comparisons to reference data and to baseline data.                                                                                                                                                                                                                                                                                                                                                                                                             | Low action response includes an expanded spatial water quality sampling program to identify the source(s) of copper to the watercourse.                                                                                                                                                         |
| <b>Sheardown Lake Tributaries 9 and 12</b>           | Water quality met all AEMP benchmarks in 2020.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | No ecologically significant and/or adverse effects on phytoplankton or benthic invertebrate community endpoints based on comparisons to reference data and to baseline data.                                                                                                                                                                                                                                                                                                                                                                                                                                   | Low action response to add water quality monitoring stations to each of these tributaries to assist in determination of effects to biota in the future.                                                                                                                                         |
| <b>Sheardown Lake Northwest and Southeast basins</b> | Arsenic concentration in sediment greater than AEMP benchmark.<br>Chromium concentration in sediment greater than AEMP benchmark.<br>Iron concentration in sediment greater than AEMP benchmark.<br>Manganese concentration in sediment greater than AEMP benchmark.<br>Nickel concentration in sediment greater than AEMP benchmark.                                                                                                                                                                                           | No AEMP water quality benchmarks were exceeded at Sheardown Lake in 2020. For all parameters, no change in concentration in sediment was shown compared to background and/or baseline, indicating the change was not mine-related.                                                                                                                                                                                                                                                                                                                                                                             | Low action response to examine the relevance of site-specific sediment quality AEMP benchmarks for Sheardown Lake SE and, if necessary, establish new AEMP benchmarks taking into consideration data from the reference lake and applicable sediment quality guidelines.                        |
| <b>Mary River</b>                                    | Aluminum concentration in water greater than AEMP benchmark in summer.<br>Copper concentration in water greater than AEMP benchmark in summer.<br>Iron concentration in water greater than AEMP benchmark in summer.<br>Lead concentration in water greater than AEMP benchmark in summer.                                                                                                                                                                                                                                      | Concentrations of metals in water of Mary River during the summer occurred as a result of high turbidity in 2020, and were comparable to background and/or baseline indicating that the elevated concentrations in 2020 were not mine-related. No adverse effects on phytoplankton, benthic invertebrates, or fish were indicated at Mary River compared to reference data or to baseline conditions.                                                                                                                                                                                                          | No changes recommended to monitoring program for Mary River due to exceedances of AEMP benchmarks.                                                                                                                                                                                              |
| <b>Mary Lake</b>                                     | Manganese concentration in sediment greater than AEMP benchmark at a single profundal station.                                                                                                                                                                                                                                                                                                                                                                                                                                  | No AEMP water quality benchmarks were exceeded at Mary Lake in 2020. Isolated occurrence of this exceedance, and the fact that average concentrations of manganese in sediment were comparable to background and baseline, indicated that change was not mine-related. No adverse effects on phytoplankton, benthic invertebrates, or fish compared to reference data and to baseline conditions.                                                                                                                                                                                                              | No changes recommended to monitoring program for Mary Lake due to exceedance of AEMP benchmark.                                                                                                                                                                                                 |

conditions. Applying the Mary River Project AEMP Management Response Framework, low action responses including implementation of an expanded spatial water quality sampling program to identify the source(s) of copper to the CLT1 north branch, and establishment of benthic invertebrate community sampling stations to evaluate possible mine-related effects on biota in the upper main stem portion of CLT1, are recommended.

At CLT2, water chemistry met all AEMP benchmarks, sediment quality met all SQG, and no adverse effects on phytoplankton or benthic invertebrates were indicated relative to reference creek conditions and CLT2 baseline data in 2020. Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no adjustments to the existing AEMP are recommended.

At Camp Lake, no AEMP water quality benchmarks were exceeded, but arsenic concentrations in sediment at a single littoral station that were above the AEMP sediment quality benchmark possibly indicated a mine-related change in 2020 relative to background and/or baseline conditions (Table 6.1). No adverse effects on phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at Camp Lake in 2020 based on comparisons to reference lake conditions and to Camp Lake baseline data. No identifiable mine-related sources of arsenic to the Camp Lake system were evident, and the current AEMP does not adequately capture variability in sediment chemistry at littoral habitat of Camp Lake. Considering arsenic concentrations in sediment, sources of arsenic to the system, and the current AEMP design, a low action response is recommended at Camp Lake under the AEMP Management Response Framework. To this end, harmonizing lake sediment quality and benthic invertebrate community monitoring stations, focusing on littoral habitat, is recommended to improve the ability of the program to evaluate mine-related effects to sediment quality at littoral areas and to potentially allow linkages to be determined between metal concentrations in sediment and benthic invertebrate community responses in the future.

### **6.3 Sheardown Lake System**

Within the Sheardown Lake system, AEMP monitoring is conducted at Sheardown Lake Tributaries 1, 12, and 9 (SDLT1, SDLT12, and SDLT9, respectively), Sheardown Lake NW (DL0-01) and Sheardown Lake SE (DL0-02). At the Sheardown Lake tributaries, AEMP water quality benchmarks were exceeded in 2020 for copper at SDLT1 (Table 6.1), but because no elevation in copper concentrations was indicated compared to baseline conditions, copper concentrations naturally appeared to be near the AEMP benchmark at this tributary. No adverse effects to phytoplankton or benthic invertebrates were indicated at SDLT1 or at either SDLT12 or SDLT9 in 2020 based on comparison to reference creek concentrations and respective Sheardown Lake Tributary baseline data. Because no adverse effects to biota were associated



with copper concentrations above the AEMP benchmark at SDLT1, a low action response to identify the likely source(s) of copper to the system is recommended to meet obligations under the AEMP Management Response Framework. Although no mine-related changes to phytoplankton or benthic invertebrates were indicated at SDLT12 and SDLT9 in 2020, a low action response to add a water quality monitoring station at each of these two tributaries under the AEMP is recommended to improve the ability of the program to interpret biological data in the future.

At Sheardown Lake NW, no AEMP benchmarks for water quality were exceeded in 2020. Lake-specific AEMP benchmarks for sediment quality were exceeded for arsenic, iron, manganese, and nickel in 2020, but none of these metals were elevated in the sediment of Sheardown Lake NW compared to the reference lake and to concentrations at Sheardown Lake NW during baseline (Table 6.1). No adverse effects to phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at Sheardown Lake NW in 2020 based on comparisons to reference conditions and to Sheardown Lake NW baseline conditions. Because no mine-related changes in metal concentrations occurred in sediment at Sheardown Lake NW in 2020, and no adverse effects to biota were associated with concentrations of metals above AEMP sediment quality benchmarks, a low action response is recommended to meet obligations under the AEMP Management Response Framework. Specifically, it is recommended that, because concentrations of metals in Sheardown Lake NW sediment have been similar to those shown at the reference lake, consideration should be given to updating the AEMP sediment quality benchmarks for Sheardown Lake NW to reflect not only baseline data, but also reference lake data.

At Sheardown Lake SE, no AEMP benchmarks for water quality were exceeded in 2020. Lake-specific AEMP benchmarks for sediment quality were exceeded for chromium, iron, manganese, and nickel concentrations at Sheardown Lake SE in 2020 (Table 6.1). However, none of these metals occurred at concentrations in sediment of Sheardown Lake SE that were elevated compared to the reference lake, or to concentrations shown at Sheardown Lake SE during the baseline period. In addition, concentrations of these metals were above the Sheardown Lake SE AEMP benchmarks in sediment at the reference lake, suggesting naturally high concentrations of each of the indicated metals in sediments of area lakes. No adverse effects to phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at Sheardown Lake SE in 2020 based on comparisons to reference conditions and to applicable Sheardown Lake SE baseline conditions. Because no mine-related changes in metal concentrations occurred in sediment at Sheardown Lake SE in 2020 and no adverse effects to biota were associated with concentrations of metals above AEMP benchmarks for sediment quality, a low action response is recommended to meet obligations under the AEMP Management Response Framework. Specifically, it is recommended that the relevance of site-specific sediment quality AEMP



benchmarks for Sheardown Lake SE be assessed and, if necessary, determined anew taking into consideration data from the reference lake and applicable sediment quality guidelines.

#### **6.4 Mary River and Mary Lake Systems**

Within the Mary River and Mary Lake systems, AEMP monitoring is conducted at Mary River Tributary-F (MRTF), Mary River, and Mary Lake (BL0). At MRTF, no AEMP benchmarks for water quality were exceeded in 2020, and for parameters with established AEMP benchmarks, no changes in concentrations were shown relative to baseline. No adverse effects on phytoplankton were indicated at MRTF in 2020. Biological sampling conducted at MRTF to meet MDMER obligations suggested some differences in benthic invertebrate community assemblages between effluent-exposed and reference areas, but these differences did not appear to be related to metal concentrations originating from mine effluent and/or mine operations (Minnow 2021). Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and to baseline, and no adverse biological effects related to metals were indicated in 2020, no changes to the existing sampling program at MRTF are recommended.

At Mary River, concentrations of aluminum, copper, iron, and lead were above respective AEMP benchmarks at stations located adjacent to the mine (i.e., E0 series stations) and, with the exception of lead, downstream of the mine (C0 series) in 2020 (Table 6.1). However, the concentrations for each of these parameters were similar or higher, and above applicable AEMP benchmarks, at the Mary River reference stations (G0-09 series) and/or upstream stations (G0 series), reflecting highly turbid sampling conditions that occurred in 2020. No mine-related changes to parameter concentrations were indicated at Mary River mine-exposed stations in 2020 compared to the reference stations and to Mary River baseline data. In addition, metal concentrations in sediment were well below SQG, and no adverse effects on phytoplankton, benthic invertebrates, and fish (arctic charr) health were indicated at all Mary River mine-exposed areas in 2020. Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no changes to AEMP monitoring at Mary River are recommended as per the AEMP Management Response Framework.

At Mary Lake, no AEMP benchmarks for water quality were exceeded in 2020. Lake-specific AEMP benchmarks for sediment quality were exceeded for manganese concentrations at a single profundal station in 2020 (Table 6.1). The isolated occurrence of this exceedance, and the fact that average manganese concentrations in sediment at Mary Lake were not elevated compared to concentrations at the reference lake or to those at Mary Lake during baseline, indicated no mine-related change in manganese concentrations at Mary Lake since commercial mine operations commenced in 2015. No adverse effects on phytoplankton, benthic invertebrates, nor



on fish (arctic charr) health were indicated at Mary Lake in 2020 based on comparisons to reference lake conditions and to Mary Lake baseline data. Because no changes in concentrations of AEMP benchmark parameters occurred relative to background and baseline and no adverse biological effects were indicated in 2020, no changes to AEMP monitoring at Mary Lake are recommended as per the AEMP Management Response Framework.





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**Mary River Project 2020  
Core Receiving Environment Monitoring  
Program Report**

**Part 2 of 3  
(Appendices A to D)**

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**APPENDIX A**  
**DATA QUALITY REVIEW**

## APPENDIX A DATA QUALITY REVIEW

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## A1 INTRODUCTION

Data Quality Review (DQR) was conducted on data collected as part of the Mary River Project 2020 CREMP to define the overall quality of the data collected for the program, and by extension, the confidence with which the data could be used to derive conclusions. 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. Depending on the magnitude of these influences, inaccuracy or imprecision have the potential to affect the reliability of conclusions drawn from the available data. Therefore, it is important to ensure that 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) and thus assure the quality of the data.

The Mary River Project 2020 CREMP DQR involved comparison of field performance to generic environmental study data quality objectives (DQO) for the evaluation of sample blanks, data precision, and data accuracy. DQO were established *a priori* to reflect reasonable and achievable performance expectations. Overall, the intent of comparing data to DQO was not to reject any measurement that did not meet the DQO, but rather to evaluate whether, based on the available data and using a weight-of-evidence approach, the field and/or analytical sample data adequately reflected actual conditions and thus could be used with confidence to derive study conclusions. Using this approach, questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project. Quality Control (QC) samples assessed for the Mary River Project CREMP included water sample trip blanks, field blanks, equipment blanks, and field duplicates, and verification of the accuracy of sub-sampling and organism recovery for the benthic invertebrate component, defined as follows:

- **Blanks** (water quality samples) are samples of deionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. Blank samples reflect contamination that occurred from the equipment (in the case of equipment blanks), in the field (in the case of trip or field blanks), or in the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be non--detectable, although a data quality objective of five times the laboratory reportable detection limit (RDL) allowed for slight “noise” around the detection limit.
- **Trip Blanks** are meant to detect any widespread contamination resulting from the container (including caps) and preservative during transport and storage. A trip blank is a bottle set to which deionized water has been added in a laboratory prior to





the field sample collections, which is transported with the regular sample bottles in the field, and remains unopened throughout the trip.

- **Field Blanks** mimic the sampling and preservative process but do not come in contact with ambient water. Field blanks are exposed to the sampling environment at the sample site. Consequently, they provide information on contamination resulting from the handling technique and through exposure to the atmosphere. They are processed in the same manner as the associated field samples (i.e., they are exposed to all the same potential sources of contamination as the field sample), including handling and, in some cases, filtration and/or preservation.
- **Equipment Blanks** are samples of deionized water collected from the sampling equipment following decontamination (i.e., rinsing of the sampling device using deionized water) in the field between sampling stations and/or events. These blanks are useful in identifying cross contamination of samples in the field as a result of the sampling device.
- **Field Duplicates** (water quality samples) are sub-sample pairs collected from randomly selected field stations using identical collection and handling methods that are then analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory. The data from field duplicate samples reflect natural variability, as well as the variability associated with sample collection methods, and therefore provide a measure of field precision.
- **Sub-Sampling Checks** (benthic invertebrate community samples) are used when excessive sample volume and/or organism density results in only a fraction of the original sample being analyzed. By comparing the numbers of benthic invertebrates recovered between at least two sub-samples, this measure provides an evaluation of how effective the sub-sampling method was in evenly dividing the original sample during processing in the laboratory. Therefore, sub-sampling error provides a measure of analytical precision. The processing of entire samples in representative sample fractions also allows an evaluation of sub-sampling accuracy.
- **Organism Recovery Checks** (benthic invertebrate community samples) involve the re-processing of previously sorted material from a randomly selected sample to determine the number of invertebrates that were not recovered during the original sample processing. The reprocessing is conducted by an analyst not involved during the original processing to reduce bias. This check allows the determination of accuracy through assessment of recovery efficiency.



## A2 RESULTS

### A2.1 Water Quality

#### A2.1.1 Sample Blanks

Trip blank samples were taken on field sampling campaigns a total of nine times during the 2020 CREMP, including two during the winter lake monitoring event (April), one during the spring stream monitoring event (early July), three during the summer lake/stream monitoring event (late July/early August), and three during the fall lake/stream monitoring event (late August). Of the 755 total analyses conducted on the trip blank samples, only 11 (1.5%) resulted in analyte detection above the trip blank DQO of less than five-times the laboratory reporting limit (LRL; Appendix Table A.1). No parameters showed concentrations that were consistently elevated above the trip blank DQO among sampling events, or between total and dissolved sample fractions (metals only; Appendix Table A.1), suggesting no widespread contamination from the bottle, bottle caps, or preservative or through the transport of the samples.

Field blank samples were assessed a total of eight times during the 2020 CREMP, including two during the winter lake monitoring event, one during the spring stream monitoring event, two during the summer lake/stream monitoring event, and three during the fall lake/stream monitoring event. Of the 678 determinations made, 32 (4.7%) resulted in analyte detections above the DQO of less than five-times the laboratory LRL (Appendix Table A.2). The majority of these exceedances were from a single sample collected during the fall lake/stream monitoring event (JLO-01-S02), which had 26 of the 32 detections above the DQO (Appendix Table A.2). Overall, with the exception of the fall lake/stream sample (JLO-01-S02), frequency of detected parameter concentrations in field blanks was low, no pervasive contamination of samples resulting from the handling technique or through exposure to the atmosphere was suggested by the field blank analyses.

Equipment blank samples were collected a total of six times during the 2020 CREMP, including two during the winter lake monitoring event, two during the summer lake monitoring event, and three during the fall lake monitoring event. Of the 503 determinations conducted, 3 (0.60%) resulted in analyte detection above the DQO of less than five-times the laboratory LRL (Appendix Table A.3). Due to the infrequency of detected parameter concentrations in field equipment blanks, minimal cross contamination of samples likely occurred in the field due to the use of the sampling device itself and/or the field sampling procedures.



Table A.1: Water Sample Trip Blank Results with Reference to Data Quality Objectives, Mary River CREMP, 2020

| Client Sample ID                          |          | Lowest<br>LRL <sup>a</sup> | DL0-02-04-S03 | DL0-01-02-S03 | G0-09-A03   | BLO-01-A-B03 | REF3-02-S03 | GO-0303    | BLO-05-B-B03 | REF3-01-B03 | E0-2103     |
|-------------------------------------------|----------|----------------------------|---------------|---------------|-------------|--------------|-------------|------------|--------------|-------------|-------------|
| Date Sampled                              |          |                            | 14-Apr-2020   | 17-Apr-2020   | 4-Jul-2020  | 30-Jul-2020  | 2-Aug-2020  | 2-Aug-2020 | 28-Aug-2020  | 29-Aug-2020 | 28-Aug-2020 |
| Time Sampled                              |          |                            | 13:40         | 10:15         | 11:35       | 11:00        | 10:00       | 10:15      | 14:20        | 10:05       | 11:28       |
| ALS Sample ID                             |          |                            | L2436713-2    | L2438141-2    | L2470180-26 | L2482114-7   | L2482822-8  | L2482823-2 | L2496051-11  | L2496136-7  | L2496071-15 |
|                                           | Units    |                            |               |               |             |              |             |            |              |             |             |
| Physical Tests                            |          |                            |               |               |             |              |             |            |              |             |             |
| Conductivity                              | umhos/cm | 3                          | <3.0          | <3.0          | <3.0        | 7.2          | 7.9         | <3.0       | <3.0         | <3.0        | <3.0        |
| Hardness (as CaCO <sub>3</sub> )          | mg/L     | 0.500                      | <0.50         | <0.50         | <0.50       | 1.58         | 1.48        | <0.50      | <0.50        | <0.50       | <0.50       |
| Total Suspended Solids                    | mg/L     | 2                          | <2.0          | <2.0          | <2.0        | <2.0         | <2.0        | <2.0       | <2.0         | <2.0        | <2.0        |
| Total Dissolved Solids                    | mg/L     | 10.0                       | <10           | 13            | 74          | 18           | <10         | <10        | <10          | 11          | <10         |
| Turbidity                                 | NTU      | 0.100                      | <0.10         | <0.10         | <0.10       | <0.10        | <0.10       | <0.10      | <0.10        | <0.10       | <0.10       |
| Anions and Nutrients (Water)              |          |                            |               |               |             |              |             |            |              |             |             |
| Alkalinity, Total (as CaCO <sub>3</sub> ) | mg/L     | 10.0                       | <10           | <10           | <10         | 2.9          | <10         | <10        | <10          | <10         | <10         |
| Ammonia, Total (as N)                     | mg/L     | 0.0100                     | <0.010        | <0.010        | 0.012       | <0.0050      | <0.010      | <0.010     | <0.010       | 0.026       | 0.014       |
| Bromide (Br)                              | mg/L     | 0.100                      | <0.10         | <0.10         | <0.10       | <0.050       | <0.10       | <0.10      | <0.10        | <0.10       | <0.10       |
| Chloride (Cl)                             | mg/L     | 0.500                      | <0.50         | <0.50         | <0.50       | 0.64         | 0.68        | <0.50      | <0.50        | <0.50       | <0.50       |
| Nitrate and Nitrite as N                  | mg/L     | 0.0210                     | <0.021        | <0.021        | <0.021      |              | 0.03        | <0.021     | <0.021       | <0.021      | <0.021      |
| Nitrate (as N)                            | mg/L     | 0.0200                     | <0.020        | <0.020        | <0.020      | 0.0319       | 0.030       | <0.020     | <0.020       | <0.020      | <0.020      |
| Nitrite (as N)                            | mg/L     | 0.00500                    | <0.0050       | <0.0050       | <0.0050     | <0.0010      | <0.0050     | <0.0050    | <0.0050      | <0.0050     | <0.0050     |
| Total Kjeldahl Nitrogen                   | mg/L     | 0.150                      | <0.15         | <0.15         | <0.15       | <0.050       | <0.15       | <0.15      | <0.15        | <0.15       | <0.15       |
| Phosphorus, Total                         | mg/L     | 0.00300                    | <0.0030       | <0.0030       | <0.0030     | <0.0020      | <0.0030     | <0.0030    | <0.0030      | <0.0030     | <0.0030     |
| Sulfate (SO <sub>4</sub> )                | mg/L     | 0.300                      | <0.30         | <0.30         | <0.30       | <0.30        | <0.30       | <0.30      | <0.30        | <0.30       | <0.30       |
| Organic / Inorganic Carbon (Water)        |          |                            |               |               |             |              |             |            |              |             |             |
| Dissolved Organic Carbon                  | mg/L     | 0.500                      | 1.62          | 1.24          | 0.68        | <0.50        | <0.50       | 1.00       | <0.50        | 0.54        | 0.95        |
| Total Organic Carbon                      | mg/L     | 0.500                      | 1.18          | 2.98          | 1.46        | <0.50        | 1.55        | 1.61       | 1.00         | 1.01        | 1.07        |
| Total Metals (Water)                      |          |                            |               |               |             |              |             |            |              |             |             |
| Aluminum (Al)                             | mg/L     | 0.00300                    | 0.0034        | <0.0030       | <0.0030     | <0.0030      | <0.0030     | <0.0030    | <0.0030      | <0.0030     | <0.0030     |
| Antimony (Sb)                             | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Arsenic (As)                              | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Barium (Ba)                               | mg/L     | 0.0000500                  | 0.000156      | <0.000050     | <0.000050   | 0.00015      | 0.000155    | 0.000086   | <0.000050    | <0.000050   | <0.000050   |
| Beryllium (Be)                            | mg/L     | 0.000100                   | <0.00050      | <0.00050      | <0.00050    | <0.00010     | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Bismuth (Bi)                              | mg/L     | 0.000500                   | <0.00050      | <0.00050      | <0.00050    | <0.000050    | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Boron (B)                                 | mg/L     | 0.0100                     | <0.010        | <0.010        | <0.010      | <0.010       | <0.010      | <0.010     | <0.010       | <0.010      | <0.010      |
| Cadmium (Cd)                              | mg/L     | 0.0000100                  | <0.000010     | <0.000010     | <0.000010   | <0.0000050   | <0.000010   | <0.000010  | <0.000010    | <0.000010   | <0.000010   |
| Calcium (Ca)                              | mg/L     | 0.0500                     | 0.105         | <0.050        | <0.050      | 0.308        | 0.305       | <0.050     | <0.050       | <0.050      | <0.050      |
| Chromium (Cr)                             | mg/L     | 0.000500                   | <0.00050      | <0.00050      | <0.00050    | <0.00010     | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Cobalt (Co)                               | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Copper (Cu)                               | mg/L     | 0.000500                   | <0.00050      | <0.00050      | <0.00050    | <0.00050     | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Iron (Fe)                                 | mg/L     | 0.0300                     | <0.030        | <0.030        | <0.030      | <0.010       | <0.030      | <0.030     | <0.030       | <0.030      | <0.030      |
| Lead (Pb)                                 | mg/L     | 0.0000500                  | <0.000050     | <0.000050     | <0.000050   | <0.000050    | <0.000050   | <0.000050  | <0.000050    | <0.000050   | <0.000050   |
| Lithium (Li)                              | mg/L     | 0.00100                    | <0.0010       | <0.0010       | <0.0010     | <0.0010      | <0.0010     | <0.0010    | <0.0010      | <0.0010     | <0.0010     |
| Magnesium (Mg)                            | mg/L     | 0.0500                     | <0.050        | <0.050        | <0.050      | 0.199        | 0.187       | <0.050     | <0.050       | <0.050      | <0.050      |
| Manganese (Mn)                            | mg/L     | 0.0000700                  | 0.000120      | <0.000070     | <0.000070   | <0.00010     | <0.000070   | <0.000070  | <0.000070    | <0.000070   | <0.000070   |
| Mercury (Hg)                              | mg/L     | 0.0000100                  | <0.0000050    | <0.0000050    | <0.0000050  | <0.0000050   | <0.0000050  | <0.0000050 | <0.0000050   | <0.0000050  | <0.0000050  |
| Molybdenum (Mo)                           | mg/L     | 0.0000500                  | 0.000139      | <0.000050     | <0.000050   | <0.000050    | <0.000050   | <0.000050  | <0.000050    | <0.000050   | <0.000050   |
| Nickel (Ni)                               | mg/L     | 0.000500                   | <0.00050      | <0.00050      | <0.00050    | <0.00050     | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Potassium (K)                             | mg/L     | 0.0500                     | <0.20         | <0.20         | <0.20       | 0.199        | <0.20       | <0.20      | <0.20        | <0.20       | <0.20       |
| Selenium (Se)                             | mg/L     | 0.00100                    | <0.0010       | <0.0010       | <0.0010     | <0.000050    | <0.0010     | <0.0010    | <0.0010      | <0.0010     | <0.0010     |
| Silicon (Si)                              | mg/L     | 0.100                      | <0.10         | <0.10         | <0.10       | <0.10        | <0.10       | <0.10      | <0.10        | <0.10       | <0.10       |
| Silver (Ag)                               | mg/L     | 0.0000100                  | <0.000010     | <0.000010     | <0.000010   | <0.000010    | <0.000010   | <0.000010  | <0.000010    | <0.000010   | <0.000010   |
| Sodium (Na)                               | mg/L     | 0.0500                     | <0.050        | <0.050        | <0.050      | 0.857        | 0.752       | <0.050     | <0.050       | <0.050      | <0.050      |
| Strontium (Sr)                            | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | 0.00028      | 0.00026     | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Thallium (Tl)                             | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.000010    | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Tin (Sn)                                  | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Titanium (Ti)                             | mg/L     | 0.0100                     | <0.010        | <0.010        | <0.010      | <0.00030     | <0.010      | <0.010     | <0.010       | <0.010      | <0.010      |
| Uranium (U)                               | mg/L     | 0.0000100                  | <0.000010     | <0.000010     | <0.000010   | <0.000010    | <0.000010   | <0.000010  | <0.000010    | <0.000010   | 0.000011    |
| Vanadium (V)                              | mg/L     | 0.00100                    | <0.0010       | <0.0010       | <0.0010     | <0.00050     | <0.0010     | <0.0010    | <0.0010      | <0.0010     | <0.0010     |
| Zinc (Zn)                                 | mg/L     | 0.00300                    | <0.0030       | <0.0030       | <0.0030     | <0.0030      | <0.0030     | <0.0030    | <0.0030      | <0.0030     | <0.0030     |
| Dissolved Metals (Water)                  |          |                            |               |               |             |              |             |            |              |             |             |
| Aluminum (Al)                             | mg/L     | 0.00300                    | <0.0030       | <0.0030       | <0.0030     | 0.0011       | <0.0030     | <0.0030    | <0.0030      | <0.0030     | <0.0030     |
| Antimony (Sb)                             | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Arsenic (As)                              | mg/L     | 0.000100                   | <0.00010      | <0.00010      | <0.00010    | <0.00010     | <0.00010    | <0.00010   | <0.00010     | <0.00010    | <0.00010    |
| Barium (Ba)                               | mg/L     | 0.0000500                  | <0.000050     | <0.000050     | <0.000050   | 0.00016      | 0.000142    | <0.000050  | 0.000079     | <0.000050   | <0.000050   |
| Beryllium (Be)                            | mg/L     | 0.000100                   | <0.00050      | <0.00050      | <0.00050    | <0.00010     | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Bismuth (Bi)                              | mg/L     | 0.000500                   | <0.00050      | <0.00050      | <0.00050    | <0.000050    | <0.00050    | <0.00050   | <0.00050     | <0.00050    | <0.00050    |
| Boron (B)                                 | mg/L     | 0.0100                     | <0.010        | <0.010        | <0.010      | <0.010       | <0.010      | <0.010     | <0.010       | <0.010      | <0.010      |
| Cadmium (Cd)                              | mg/L     | 0.0000100                  | <0.000010     | <0.000010     | <0.000010   | <0.0000050   | <0.000010   | <0.000010  | <0.000.      |             |             |

Table A.2: Water Sample Field Blank Results with Reference to Data Quality Objectives, Mary River CREMP, 2020

| Parameter                                 |          | Lowest LRL <sup>a</sup> | DL0-02-03-S02 | BL0-01-S02  | L1-08-02    | JLO-02-S02  | DLO-02-08-S02 | JLO-01-S02  | DLO-01-04-S02 | L1-0902     |
|-------------------------------------------|----------|-------------------------|---------------|-------------|-------------|-------------|---------------|-------------|---------------|-------------|
|                                           |          |                         | 15-Apr-2020   | 19-Apr-2020 | 4-Jul-2020  | 29-Jul-2020 | 28-Jul-2020   | 30-Aug-2020 | 27-Aug-2020   | 30-Aug-2020 |
|                                           |          |                         | 9:45          | 10:20       | 9:45        | 13:30       | 11:40         | 9:30        | 10:00         | 8:25        |
|                                           |          |                         | L2437255-2    | L2438194-2  | L2470180-22 | L2481531-2  | L2480819-19   | L2496168-1  | L2495475-5    | L2496202-3  |
| Physical Tests                            | Units    |                         |               |             |             |             |               |             |               |             |
| Conductivity                              | umhos/cm | 3                       | <3.0          | <3.0        | <3.0        | 5.5         | <2.0          | 155         | <3.0          | <3.0        |
| Hardness (as CaCO <sub>3</sub> )          | mg/L     | 10.0                    | <0.50         | <0.50       | <0.50       | 1.43        | 0.83          | 78.7        | <0.50         | <0.50       |
| pH                                        | pH units | -                       | 6.67          | 5.91        | 6.75        | 6.55        | 6.59          | 8.09        | 6.06          | 6.38        |
| Total Suspended Solids                    | mg/L     | 2                       | <2.0          | <2.0        | <2.0        | <2.0        | <2.0          | <2.0        | <2.0          | <2.0        |
| Total Dissolved Solids                    | mg/L     | 20.0                    | 20            | 13          | 43          | 12          | <10           | 171         | <10           | 74          |
| Turbidity                                 | NTU      | 0.100                   | <0.10         | <0.10       | <0.10       | <0.10       | <0.10         | 0.27        | <0.10         | <0.10       |
| Anions and Nutrients (Water)              |          |                         |               |             |             |             |               |             |               |             |
| Alkalinity, Total (as CaCO <sub>3</sub> ) | mg/L     | 10.0                    | <10           | <10         | <10         | 2.7         | 1.4           | 70          | <10           | <10         |
| Ammonia, Total (as N)                     | mg/L     | 0.0200                  | <0.010        | <0.010      | <0.010      | <0.0050     | <0.0050       | <0.010      | <0.010        | <0.010      |
| Bromide (Br)                              | mg/L     | 0.100                   | <0.10         | <0.10       | <0.10       | <0.050      | <0.050        | <0.10       | <0.10         | <0.10       |
| Chloride (Cl)                             | mg/L     | 0.500                   | <0.50         | <0.50       | <0.50       | <0.50       | <0.50         | 4.87        | <0.50         | <0.50       |
| Nitrate and Nitrite as N                  | mg/L     | 0.0210                  | <0.021        | <0.021      | <0.021      |             |               | 0.032       | <0.021        | <0.021      |
| Nitrate (as N)                            | mg/L     | 0.0200                  | <0.020        | <0.020      | <0.020      | 0.0226      | <0.0050       | 0.032       | <0.020        | <0.020      |
| Nitrite (as N)                            | mg/L     | 0.00500                 | <0.0050       | <0.0050     | <0.0050     | <0.0010     | <0.0010       | <0.0050     | <0.0050       | <0.0050     |
| Total Kjeldahl Nitrogen                   | mg/L     | 0.150                   | <0.15         | <0.15       | <0.15       | <0.050      | <0.050        | <0.15       | <0.15         | <0.15       |
| Phosphorus, Total                         | mg/L     | 0.00300                 | <0.0030       | <0.0030     | <0.0030     | <0.0020     | <0.0020       | <0.0030     | <0.0030       | <0.0030     |
| Sulfate (SO <sub>4</sub> )                | mg/L     | 0.300                   | <0.30         | <0.30       | <0.30       | <0.30       | <0.30         | 4.76        | <0.30         | <0.30       |
| Organic / Inorganic Carbon (Water)        |          |                         |               |             |             |             |               |             |               |             |
| Dissolved Organic Carbon                  | mg/L     | 0.500                   | 0.88          | 1.23        | <0.50       | <0.50       | <0.50         | 2.5         | <0.50         | 0.89        |
| Total Organic Carbon                      | mg/L     | 0.500                   | 1.06          | 2.69        | 1.30        | 0.57        | <0.50         | 3.23        | 0.89          | 1.09        |
| Total Metals (Water)                      |          |                         |               |             |             |             |               |             |               |             |
| Aluminum (Al)                             | mg/L     | 0.00300                 | <0.0030       | <0.0030     | <0.0030     | <0.0030     | <0.0030       | 0.0049      | <0.0030       | <0.0030     |
| Antimony (Sb)                             | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Arsenic (As)                              | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Barium (Ba)                               | mg/L     | 0.0000500               | <0.000050     | <0.000050   | <0.000050   | 0.00015     | 0.00017       | 0.00742     | 0.000103      | <0.000050   |
| Beryllium (Be)                            | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.00010    | <0.00010      | <0.00050    | <0.00050      | <0.00050    |
| Bismuth (Bi)                              | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.000050   | <0.000050     | <0.00050    | <0.00050      | <0.00050    |
| Boron (B)                                 | mg/L     | 0.0100                  | <0.010        | <0.010      | <0.010      | <0.010      | <0.010        | <0.010      | <0.010        | <0.010      |
| Cadmium (Cd)                              | mg/L     | 0.0000100               | <0.000010     | <0.000010   | <0.000010   | <0.0000050  | <0.0000050    | <0.000010   | <0.000010     | <0.000010   |
| Calcium (Ca)                              | mg/L     | 0.0500                  | <0.050        | <0.050      | <0.050      | 0.286       | 0.207         | 15.3        | <0.050        | <0.050      |
| Chromium (Cr)                             | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.00010    | <0.00010      | <0.00050    | <0.00050      | <0.00050    |
| Cobalt (Co)                               | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Copper (Cu)                               | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.00050    | <0.00050      | 0.00088     | <0.00050      | <0.00050    |
| Iron (Fe)                                 | mg/L     | 0.0300                  | <0.030        | <0.030      | <0.030      | <0.010      | <0.010        | <0.030      | <0.030        | <0.030      |
| Lead (Pb)                                 | mg/L     | 0.0000500               | <0.000050     | <0.000050   | <0.000050   | <0.000050   | <0.000050     | <0.000050   | <0.000050     | <0.000050   |
| Lithium (Li)                              | mg/L     | 0.00100                 | <0.0010       | <0.0010     | <0.0010     | <0.0010     | <0.0010       | 0.0012      | <0.0010       | <0.0010     |
| Magnesium (Mg)                            | mg/L     | 0.0500                  | <0.050        | <0.050      | <0.050      | 0.172       | 0.0904        | 9.45        | <0.050        | <0.050      |
| Manganese (Mn)                            | mg/L     | 0.0000700               | <0.000070     | <0.000070   | <0.000070   | <0.00010    | <0.00010      | 0.00121     | <0.000070     | <0.000070   |
| Mercury (Hg)                              | mg/L     | 0.0000100               | <0.0000050    | <0.0000050  | <0.0000050  | <0.0000050  | <0.0000050    | <0.0000050  | <0.0000050    | <0.0000050  |
| Molybdenum (Mo)                           | mg/L     | 0.0000500               | <0.000050     | <0.000050   | <0.000050   | <0.000050   | <0.000050     | 0.000397    | <0.000050     | <0.000050   |
| Nickel (Ni)                               | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.00050    | <0.00050      | 0.00059     | <0.00050      | <0.00050    |
| Potassium (K)                             | mg/L     | 0.200                   | <0.20         | <0.20       | <0.20       | 0.125       | <0.050        | 1.31        | <0.20         | <0.20       |
| Selenium (Se)                             | mg/L     | 0.00100                 | <0.0010       | <0.0010     | <0.0010     | <0.000050   | <0.000050     | <0.0010     | <0.0010       | <0.0010     |
| Silicon (Si)                              | mg/L     | 0.100                   | <0.10         | <0.10       | <0.10       | <0.10       | <0.10         | 0.35        | <0.10         | <0.10       |
| Silver (Ag)                               | mg/L     | 0.0000100               | <0.000010     | <0.000010   | <0.000010   | <0.000010   | <0.000010     | <0.000010   | <0.000010     | <0.000010   |
| Sodium (Na)                               | mg/L     | 0.0500                  | <0.050        | <0.050      | <0.050      | 0.553       | 0.096         | 2.11        | <0.050        | <0.050      |
| Strontium (Sr)                            | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | 0.00024     | <0.00020      | 0.0111      | <0.00010      | <0.00010    |
| Thallium (Tl)                             | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.000010   | <0.000010     | <0.00010    | <0.00010      | <0.00010    |
| Tin (Sn)                                  | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Titanium (Ti)                             | mg/L     | 0.0100                  | <0.010        | <0.010      | <0.010      | <0.00030    | <0.00030      | <0.010      | <0.010        | <0.010      |
| Uranium (U)                               | mg/L     | 0.0000100               | <0.000010     | <0.000010   | <0.000010   | <0.000010   | <0.000010     | 0.00133     | <0.000010     | 0.000013    |
| Vanadium (V)                              | mg/L     | 0.00100                 | <0.0010       | <0.0010     | <0.0010     | <0.00050    | <0.00050      | <0.0010     | <0.0010       | <0.0010     |
| Zinc (Zn)                                 | mg/L     | 0.00300                 | <0.0030       | <0.0030     | <0.0030     | <0.0030     | <0.0030       | <0.0030     | <0.0030       | <0.0030     |
| Dissolved Metals (Water)                  |          |                         |               |             |             |             |               |             |               |             |
| Aluminum (Al)                             | mg/L     | 0.00300                 | <0.0030       | <0.0030     | <0.0030     | <0.0010     | <0.0010       | <0.0030     | <0.0030       | <0.0030     |
| Antimony (Sb)                             | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Arsenic (As)                              | mg/L     | 0.000100                | <0.00010      | <0.00010    | <0.00010    | <0.00010    | <0.00010      | <0.00010    | <0.00010      | <0.00010    |
| Barium (Ba)                               | mg/L     | 0.0000500               | <0.000050     | <0.000050   | <0.000050   | 0.00015     | <0.00010      | 0.00763     | 0.000093      | <0.000050   |
| Beryllium (Be)                            | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.00010    | <0.00010      | <0.00050    | <0.00050      | <0.00050    |
| Bismuth (Bi)                              | mg/L     | 0.000500                | <0.00050      | <0.00050    | <0.00050    | <0.000050   | <0.000050     | <0.00050    | <0.00050      | <0.00050    |
| Boron (B)                                 | mg/L     | 0.0100                  | <0.010        | <0.010      | <0.010      | <0.010      | <0.010        | <0.010      | <0.010        | <0.010      |
| Cadmium (Cd)                              | mg/L     | 0.0000100               | <0.000010     | <0.000010   | <0.000010   | <0.0000050  | <0.0000050    | <0.000010   | <0.000010     | <0.000010   |
| Calcium (Ca)                              | mg/L     | 0.0500                  | <0.050        | <0.050      | <0.050      | 0.294       | 0.185         | 15.5        | <0.050        | 0.10        |

Table A.3: Water Sample Equipment Blank Results with Reference to Data Quality Objectives, Mary River CREMP, 2020

| Client Sample ID<br><br>Date Sampled<br>ALS Sample ID |          | Lowest<br>LRL <sup>a</sup> | JL0-0204    | BL0-05-A04  | DD-HAB9-STN-1-S04 | REF3-03-B04 | JLO-02-B04  | DLO-02-04-S04 |
|-------------------------------------------------------|----------|----------------------------|-------------|-------------|-------------------|-------------|-------------|---------------|
|                                                       |          |                            | 12-Apr-2020 | 21-Apr-2020 | 28-Jul-2020       | 2-Aug-2020  | 30-Aug-2020 | 26-Aug-2020   |
|                                                       |          |                            | L2436314-1  | L2439027-7  | L2480819-14       | L2482822-7  | L2496168-12 | L2494774-12   |
|                                                       | Units    |                            |             |             |                   |             |             |               |
| Physical Tests                                        |          |                            |             |             |                   |             |             |               |
| Conductivity                                          | umhos/cm | 3                          | <3.0        | <3.0        | <2.0              | <3.0        | <3.0        | <3.0          |
| Hardness (as CaCO <sub>3</sub> )                      | mg/L     | 10.0                       | <0.50       | <0.50       | <0.50             | <0.50       | <0.50       | <0.50         |
| Total Suspended Solids                                | mg/L     | 2                          | <2.0        | <2.0        | <2.0              | <2.0        | <2.0        | <2.0          |
| Total Dissolved Solids                                | mg/L     | 20.0                       | <10         | 25          | <10               | <10         | 81          | <10           |
| Turbidity                                             | NTU      | 0.100                      | <0.10       | <0.10       | <0.10             | <0.10       | <0.10       | <0.10         |
| Anions and Nutrients (Water)                          |          |                            |             |             |                   |             |             |               |
| Alkalinity, Total (as CaCO <sub>3</sub> )             | mg/L     | 10.0                       | <10         | <10         | <1.0              | <10         | <10         | <10           |
| Ammonia, Total (as N)                                 | mg/L     | 0.0200                     | <0.010      | <0.010      | <0.0050           | <0.010      | <0.010      | <0.010        |
| Bromide (Br)                                          | mg/L     | 0.100                      | <0.10       | <0.10       | <0.050            | <0.10       | <0.10       | <0.10         |
| Chloride (Cl)                                         | mg/L     | 0.500                      | <0.50       | <0.50       | <0.50             | <0.50       | <0.50       | <0.50         |
| Nitrate and Nitrite as N                              | mg/L     | 0.0210                     | <0.021      | <0.021      | <0.021            | <0.021      | <0.021      | 0.099         |
| Nitrate (as N)                                        | mg/L     | 0.0200                     | <0.020      | <0.020      | <0.0050           | <0.020      | <0.020      | 0.099         |
| Nitrite (as N)                                        | mg/L     | 0.00500                    | <0.0050     | <0.0050     | <0.0010           | <0.0050     | <0.0050     | <0.0050       |
| Total Kjeldahl Nitrogen                               | mg/L     | 0.150                      | <0.15       | <0.15       | <0.050            | <0.15       | <0.15       | <0.15         |
| Phosphorus, Total                                     | mg/L     | 0.00300                    | <0.0030     | <0.0030     | <0.0020           | <0.0030     | 0.004       | 0.003         |
| Sulfate (SO <sub>4</sub> )                            | mg/L     | 0.300                      | <0.30       | <0.30       | <0.30             | <0.30       | <0.30       | <0.30         |
| Organic / Inorganic Carbon (Water)                    |          |                            |             |             |                   |             |             |               |
| Dissolved Organic Carbon                              | mg/L     | 0.500                      | <0.50       | 1.25        | <0.50             | 0.54        | 0.50        | 0.56          |
| Total Organic Carbon                                  | mg/L     | 0.500                      | <0.50       | 2.49        | <0.50             | 2.16        | 1.22        | 0.92          |
| Total Metals (Water)                                  |          |                            |             |             |                   |             |             |               |
| Aluminum (Al)                                         | mg/L     | 0.00300                    | <0.0030     | <0.0030     | <0.0030           | <0.0030     | <0.0030     | <0.0030       |
| Antimony (Sb)                                         | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Arsenic (As)                                          | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Barium (Ba)                                           | mg/L     | 0.0000500                  | <0.000050   | <0.000050   | <0.00010          | <0.000050   | 0.000062    | 0.00164       |
| Beryllium (Be)                                        | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00010          | <0.00050    | <0.00050    | <0.00050      |
| Bismuth (Bi)                                          | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.000050         | <0.00050    | <0.00050    | <0.00050      |
| Boron (B)                                             | mg/L     | 0.0100                     | <0.010      | <0.010      | <0.010            | <0.010      | <0.010      | <0.010        |
| Cadmium (Cd)                                          | mg/L     | 0.0000100                  | <0.000010   | <0.000010   | <0.0000050        | <0.000010   | <0.000010   | <0.000010     |
| Calcium (Ca)                                          | mg/L     | 0.0500                     | <0.050      | <0.050      | <0.050            | <0.050      | 0.076       | <0.050        |
| Chromium (Cr)                                         | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00010          | <0.00050    | <0.00050    | <0.00050      |
| Cobalt (Co)                                           | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Copper (Cu)                                           | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00050          | <0.00050    | <0.00050    | <0.00050      |
| Iron (Fe)                                             | mg/L     | 0.0300                     | <0.030      | <0.030      | <0.010            | <0.030      | <0.030      | <0.030        |
| Lead (Pb)                                             | mg/L     | 0.0000500                  | <0.000050   | <0.000050   | <0.000050         | <0.000050   | <0.000050   | <0.000050     |
| Lithium (Li)                                          | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.0010           | <0.0010     | <0.0010     | <0.0010       |
| Magnesium (Mg)                                        | mg/L     | 0.0500                     | <0.050      | <0.050      | <0.0050           | <0.050      | <0.050      | <0.050        |
| Manganese (Mn)                                        | mg/L     | 0.0000700                  | <0.000070   | <0.000070   | <0.00010          | <0.000070   | <0.000070   | 0.000113      |
| Mercury (Hg)                                          | mg/L     | 0.0000100                  | <0.0000050  | <0.0000050  | <0.0000050        | <0.0000050  | <0.0000050  | <0.0000050    |
| Molybdenum (Mo)                                       | mg/L     | 0.0000500                  | <0.000050   | <0.000050   | <0.000050         | <0.000050   | <0.000050   | <0.000050     |
| Nickel (Ni)                                           | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00050          | <0.00050    | <0.00050    | <0.00050      |
| Potassium (K)                                         | mg/L     | 0.200                      | <0.20       | <0.20       | <0.050            | <0.20       | <0.20       | <0.20         |
| Selenium (Se)                                         | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.000050         | <0.0010     | <0.0010     | <0.0010       |
| Silicon (Si)                                          | mg/L     | 0.100                      | <0.10       | <0.10       | <0.10             | <0.10       | <0.10       | <0.10         |
| Silver (Ag)                                           | mg/L     | 0.0000100                  | <0.000010   | <0.000010   | <0.000010         | <0.000010   | <0.000010   | <0.000010     |
| Sodium (Na)                                           | mg/L     | 0.0500                     | <0.050      | <0.050      | <0.050            | <0.050      | 0.117       | 0.109         |
| Strontium (Sr)                                        | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00020          | <0.00010    | <0.00010    | 0.00011       |
| Thallium (Tl)                                         | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.000010         | <0.00010    | <0.00010    | <0.00010      |
| Tin (Sn)                                              | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Titanium (Ti)                                         | mg/L     | 0.0100                     | <0.010      | <0.010      | <0.00030          | <0.010      | <0.010      | <0.010        |
| Uranium (U)                                           | mg/L     | 0.0000100                  | <0.000010   | <0.000010   | <0.000010         | <0.000010   | <0.000010   | <0.000010     |
| Vanadium (V)                                          | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.00050          | <0.0010     | <0.0010     | <0.0010       |
| Zinc (Zn)                                             | mg/L     | 0.00300                    | <0.0030     | <0.0030     | <0.0030           | <0.0030     | <0.0030     | <0.0030       |
| Dissolved Metals (Water)                              |          |                            |             |             |                   |             |             |               |
| Aluminum (Al)                                         | mg/L     | 0.00300                    | <0.0030     | 0.0031      | <0.0010           | <0.0030     | <0.0030     | <0.0030       |
| Antimony (Sb)                                         | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Arsenic (As)                                          | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Barium (Ba)                                           | mg/L     | 0.0000500                  | <0.000050   | 0.0000950   | <0.00010          | 0.000051    | 0.000070    | 0.000078      |
| Beryllium (Be)                                        | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00010          | <0.00050    | <0.00050    | <0.00050      |
| Bismuth (Bi)                                          | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.000050         | <0.00050    | <0.00050    | <0.00050      |
| Boron (B)                                             | mg/L     | 0.0100                     | <0.010      | <0.010      | <0.010            | <0.010      | <0.010      | <0.010        |
| Cadmium (Cd)                                          | mg/L     | 0.0000100                  | <0.000010   | <0.000010   | <0.0000050        | <0.000010   | <0.000010   | <0.000010     |
| Calcium (Ca)                                          | mg/L     | 0.0500                     | <0.050      | <0.050      | <0.050            | 0.061       | 0.067       | 0.051         |
| Chromium (Cr)                                         | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00010          | <0.00050    | <0.00050    | <0.00050      |
| Cobalt (Co)                                           | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Copper (Cu)                                           | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00020          | <0.00050    | <0.00050    | <0.00050      |
| Iron (Fe)                                             | mg/L     | 0.0300                     | <0.030      | <0.030      | <0.010            | <0.030      | <0.030      | <0.030        |
| Lead (Pb)                                             | mg/L     | 0.0000500                  | <0.000050   | <0.000050   | <0.000050         | <0.000050   | <0.000050   | <0.000050     |
| Lithium (Li)                                          | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.0010           | <0.0010     | <0.0010     | <0.0010       |
| Magnesium (Mg)                                        | mg/L     | 0.0500                     | <0.050      | <0.050      | <0.0050           | <0.050      | <0.050      | <0.050        |
| Manganese (Mn)                                        | mg/L     | 0.0000700                  | <0.000070   | 0.000074    | <0.00010          | <0.000070   | <0.000070   | 0.000106      |
| Mercury (Hg)                                          | mg/L     | 0.0000100                  | <0.0000050  | <0.0000050  | <0.0000050        | <0.0000050  | <0.0000050  | <0.0000050    |
| Molybdenum (Mo)                                       | mg/L     | 0.0000500                  | <0.000050   | <0.000050   | <0.000050         | <0.000050   | <0.000050   | <0.000050     |
| Nickel (Ni)                                           | mg/L     | 0.000500                   | <0.00050    | <0.00050    | <0.00050          | <0.00050    | <0.00050    | <0.00050      |
| Potassium (K)                                         | mg/L     | 0.200                      | <0.20       | <0.20       | <0.050            | <0.20       | <0.20       | <0.20         |
| Selenium (Se)                                         | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.000050         | <0.0010     | <0.0010     | <0.0010       |
| Silicon (Si)                                          | mg/L     | 0.100                      | <0.10       | <0.10       | <0.050            | <0.10       | <0.10       | <0.10         |
| Silver (Ag)                                           | mg/L     | 0.0000100                  | <0.000010   | 0.000019    | <0.000010         | <0.000010   | <0.000010   | <0.000010     |
| Sodium (Na)                                           | mg/L     | 0.0500                     | <0.050      | 0.061       | <0.050            | <0.050      | 0.124       | 0.110         |
| Strontium (Sr)                                        | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00020          | <0.00010    | <0.00010    | <0.00010      |
| Thallium (Tl)                                         | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.000010         | <0.00010    | <0.00010    | <0.00010      |
| Tin (Sn)                                              | mg/L     | 0.000100                   | <0.00010    | <0.00010    | <0.00010          | <0.00010    | <0.00010    | <0.00010      |
| Titanium (Ti)                                         | mg/L     | 0.0100                     | <0.010      | <0.010      | <0.00030          | <0.010      | <0.010      | <0.010        |
| Uranium (U)                                           | mg/L     | 0.0000100                  | <0.000010   | <0.000010   | <0.000010         | <0.000010   | <0.000010   | <0.000010     |
| Vanadium (V)                                          | mg/L     | 0.00100                    | <0.0010     | <0.0010     | <0.00050          | <0.0010     | <0.0010     | <0.0010       |
| Zinc (Zn)                                             | mg/L     | 0.00300                    | <0.0030     | <0.0030     | <0.0010           | <0.0030     | <0.0030     | <0.0030       |
| Aggregate Organics (Water)                            |          |                            |             |             |                   |             |             |               |
| Phenols (4AAP)                                        | mg/L     | 0.00100                    | <0.0010     | 0.0023      | 0.0018            | 0.0012      | <0.0010     | <0.0010       |
| Plant Pigments (Water)                                |          |                            |             |             |                   |             |             |               |
| Chlorophyll a                                         | µg/L     | 0.100                      | <0.10       | <0.10       | 1.72              | 0.23        | <0.10       | <0.10         |
| Phaeophytin a                                         | µg/L     | 0.200                      | 0.14        | 0.31        | 1.15              | 0.99        | 0.26        | 0.22          |

Parameter did not meet the data quality objective of ≤ 5x the RDL.  
Note: LDL = Laboratory Reporting Limit.  
<sup>a</sup> For some analytes, a range of LRLs were achieved in different laboratory reports. Each blank was compared to the LRL applicable to that sample.



### **A2.1.2 Precision – Field Duplicates**

In total, eight field duplicates were collected over the course of the 2020 CREMP water quality monitoring, including two during the winter lake monitoring event, one during the spring stream monitoring event, three during the summer stream/lake monitoring event, and two during the fall stream/lake monitoring event. In general, close agreement in parameter concentrations was observed between duplicate samples, with 94% of field duplicate analyte pairs meeting the water quality field duplicate DQO of  $\leq 25\%$  Relative Percent Difference (RPD) in parameter concentrations of the 608 duplicate analyses conducted (Appendix Table A.4). Total phosphorus, total lead, dissolved aluminum, and chlorophyll a were the key parameters that most frequently did not meet the DQO between duplicate samples (Appendix Table A.4). In some cases in which DQO were not met, measured concentrations in one or both duplicate samples were close to the LRL (i.e., two- to three-times the LRL) such that small differences in concentrations between duplicate samples resulted in relatively high RPD. No seasonal patterns were suggested for those duplicate samples in which concentrations in duplicate samples failed to achieve the DQO, suggesting no consistent methodological issues. Overall, in the majority of cases, and for key parameters of concern, the RPD in analyte concentrations was sufficiently low as to not affect interpretation of the data.

## **A2.2 Benthic Invertebrate Community Samples**

### **A2.2.1 Subsampling Accuracy**

Sub-sampling of benthic invertebrate community samples was conducted on 25 of 63 stream samples (40%) and 50 of 50 lake samples (100%; total of 66% for the 2020 project). The sorted fraction for these samples was mainly 100% (whole; 77% of all samples) and 50% (half; 23% of all samples) of the sample material evaluated (average of 89%; Appendix Table A.5a,b). Sub-sampling error estimates indicated that, on average, precision and accuracy of the sub-sampled benthic invertebrate community samples met the DQO of  $\leq 20\%$  (Appendix Table A.6a,b). This indicated that precision and accuracy for sub-sampling of the benthic invertebrate community samples was acceptable.

### **A2.2.2 Organism Recovery**

Sorting efficiency (i.e., percent recovery) of benthic invertebrate samples was high, averaging 97% for lotic samples (6 samples) and 99% for lentic samples (5 samples; Appendix Tables A.7a,b). Sorting efficiency for these samples achieved the DQO of  $\geq 90\%$  recovery, and therefore the benthic invertebrate community sample recovery was considered acceptable.



Figure A.4: Water Sample Field Duplicate Results with Reference to the Data Quality Objective, Mary River CREMP, 2020

| Sample ID                                 | Units    | LRL       | JL0-07-S    | JL0-07-S01  | RPD  | JL0-02-S    | JL0-02-S01  | RPD  | F0-01       | F0-0101     | RPD  |
|-------------------------------------------|----------|-----------|-------------|-------------|------|-------------|-------------|------|-------------|-------------|------|
| Date Sampled                              |          |           | 13-Apr-2020 | 13-Apr-2020 |      | 12-Apr-2020 | 12-Apr-2020 |      | 3-Jul-2020  | 3-Jul-2020  |      |
| ALS Sample ID                             |          |           | L2436315-5  | L2436315-6  |      | L2436314-2  | L2436314-3  |      | L2470180-16 | L2470180-17 |      |
| Conductivity                              | umhos/cm | 3         | 176         | 176         | 0    | 186         | 188         | 1.1  | 108         | 107         | 0.93 |
| Hardness (as CaCO <sub>3</sub> )          | mg/L     | 10.0      | 96          | 96.3        | 0.31 | 102         | 103         | 1.0  | 49.9        | 48.2        | 3.5  |
| pH                                        | pH units | 0.100     | 7.82        | 7.82        | 0    | 7.90        | 7.91        | 0    | 7.89        | 7.95        | 0.76 |
| Total Suspended Solids                    | mg/L     | 2         | <2.0        | <2.0        | -    | <2.0        | <2.0        | -    | 9.8         | 9.7         | 1.0  |
| Total Dissolved Solids                    | mg/L     | 20.0      | 128         | 113         | 12   | 93          | 81          | 14   | 90          | 99          | 10   |
| Turbidity                                 | NTU      | 0.100     | 0.14        | 0.12        | 15   | 0.13        | 0.19        | 38   | 2.19        | 2.49        | 13   |
| Anions and Nutrients (Water)              |          |           |             |             |      |             |             |      |             |             |      |
| Alkalinity, Total (as CaCO <sub>3</sub> ) | mg/L     | 10.0      | 79          | 80          | 1.3  | 84          | 84          | 0    | 39          | 39          | 0    |
| Ammonia, Total (as N)                     | mg/L     | 0.0200    | 0.020       | 0.021       | 4.9  | 0.042       | 0.020       | 71   | <0.010      | <0.010      | -    |
| Bromide (Br)                              | mg/L     | 0.100     | <0.10       | <0.10       | -    | <0.10       | <0.10       | -    | <0.10       | <0.10       | -    |
| Chloride (Cl)                             | mg/L     | 0.500     | 5.39        | 5.51        | 2.2  | 5.73        | 5.72        | 0.17 | 1.34        | 1.47        | 9.3  |
| Nitrate and Nitrite as N                  | mg/L     | 0.0210    | 0.031       | 0.034       | 9.2  | 0.096       | 0.03        | 105  | 0.187       | 0.285       | 42   |
| Nitrate (as N)                            | mg/L     | 0.0200    | 0.031       | 0.034       | 9.2  | 0.096       | 0.030       | 105  | 0.187       | 0.285       | 42   |
| Nitrite (as N)                            | mg/L     | 0.00500   | <0.0050     | <0.0050     | -    | <0.0050     | <0.0050     | -    | <0.0050     | <0.0050     | -    |
| Total Kjeldahl Nitrogen                   | mg/L     | 0.150     | 0.17        | 0.27        | 45   | <0.15       | <0.15       | -    | <0.15       | <0.15       | -    |
| Phosphorus, Total                         | mg/L     | 0.00300   | 0.0043      | 0.0035      | 21   | 0.0092      | 0.0036      | 88   | 0.0377      | 0.0261      | 36   |
| Sulfate (SO <sub>4</sub> )                | mg/L     | 0.300     | 5.01        | 5.02        | 0    | 5.53        | 5.31        | 4.1  | 11.8        | 11.7        | 1    |
| Organic / Inorganic Carbon (Water)        |          |           |             |             |      |             |             |      |             |             |      |
| Dissolved Organic Carbon                  | mg/L     | 0.500     | 2.24        | 2.20        | 1.8  | 2.20        | 2.61        | 17   | 2.12        | 1.90        | 11   |
| Total Organic Carbon                      | mg/L     | 0.500     | 2.64        | 2.66        | 0.75 | 3.00        | 2.77        | 8.0  | 2.94        | 2.72        | 7.8  |
| Total Metals (Water)                      |          |           |             |             |      |             |             |      |             |             |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | 0.0539      | 0.0060      | 160  | 0.0183      | 0.0157      | 15   | 0.170       | 0.168       | 1.2  |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00904     | 0.00906     | 0.22 | 0.00918     | 0.00890     | 3.1  | 0.00544     | 0.00556     | 2.2  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Boron (B)                                 | mg/L     | 0.0100    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | 0.000016    | <0.000010   | 46   | 0.000017    | <0.000010   | 52   | <0.000010   | <0.000010   | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 19.1        | 18.4        | 3.7  | 19.7        | 19.3        | 2.1  | 9.35        | 9.13        | 2.4  |
| Chromium (Cr)                             | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | 0.00016     | 0.00014     | 13   |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.00195     | 0.00113     | 53   | 0.00142     | 0.00118     | 18   | 0.00051     | 0.00052     | 1.9  |
| Iron (Fe)                                 | mg/L     | 0.0300    | <0.030      | <0.030      | -    | <0.030      | <0.030      | -    | 0.202       | 0.202       | 0    |
| Lead (Pb)                                 | mg/L     | 0.0000500 | 0.000091    | <0.000050   | 58   | 0.000108    | 0.000053    | 68   | 0.000212    | 0.000159    | 29   |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0019      | 0.0016      | 17   | 0.0016      | 0.0016      | 0    | <0.0010     | <0.0010     | -    |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 11.8        | 11.9        | 0.84 | 12.4        | 12.2        | 2    | 6.67        | 6.59        | 1.2  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.00123     | 0.000262    | 130  | 0.000479    | 0.000304    | 45   | 0.00905     | 0.00911     | 0.66 |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050  | -    | <0.0000050  | <0.0000050  | -    | <0.0000050  | <0.0000050  | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000584    | 0.000459    | 24   | 0.000505    | 0.000476    | 5.9  | 0.000099    | 0.000110    | 11   |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00098     | 0.00078     | 23   | 0.00087     | 0.00081     | 7.1  | <0.00050    | <0.00050    | -    |
| Potassium (K)                             | mg/L     | 0.200     | 1.57        | 1.53        | 2.6  | 1.61        | 1.57        | 2.5  | 0.65        | 0.64        | 1.6  |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    |
| Silicon (Si)                              | mg/L     | 0.100     | 0.43        | 0.40        | 7.2  | 0.42        | 0.42        | 0    | 0.64        | 0.66        | 3.1  |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 2.64        | 2.47        | 6.7  | 2.56        | 2.53        | 1.2  | 0.439       | 0.419       | 4.7  |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.0153      | 0.0147      | 4.0  | 0.0156      | 0.0153      | 1.9  | 0.00994     | 0.00933     | 6.3  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | 0.00014     | <0.00010    | 33   | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    | 0.011       | 0.011       | 0    |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.00132     | 0.00129     | 2.3  | 0.00134     | 0.00133     | 0.7  | 0.000349    | 0.000331    | 5.3  |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | 0.0304      | <0.0030     | 164  | 0.0032      | <0.0030     | 6.5  | <0.0030     | <0.0030     | -    |
| Dissolved Metals (Water)                  |          |           |             |             |      |             |             |      |             |             |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | <0.0030     | 0.0048      | 46   | 0.0033      | 0.0031      | 6    | 0.0099      | 0.0088      | 12   |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00879     | 0.00883     | 0.45 | 0.00931     | 0.00941     | 1.1  | 0.00405     | 0.00391     | 3.5  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Boron (B)                                 | mg/L     | 0.0100    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 18.4        | 19.1        | 3.7  | 19.7        | 20.1        | 2.0  | 9.23        | 8.95        | 3.1  |
| Chromium (Cr)                             | mg/L     | 0.000500  | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    | <0.00050    | <0.00050    | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.00108     | 0.00115     | 6.3  | 0.00117     | 0.00109     | 7.1  | <0.00050    | <0.00050    | -    |
| Iron (Fe)                                 | mg/L     | 0.0300    | <0.030      | <0.030      | -    | <0.030      | <0.030      | -    | <0.030      | <0.030      | -    |
| Lead (Pb)                                 | mg/L     | 0.0000500 | <0.000050   | <0.000050   | -    | <0.000050   | <0.000050   | -    | <0.000050   | <0.000050   | -    |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0019      | 0.0019      | 0    | 0.0018      | 0.0019      | 5.4  | <0.0010     | <0.0010     | -    |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 12.1        | 11.8        | 2.5  | 12.8        | 12.9        | 0.78 | 6.51        | 6.27        | 3.8  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.000143    | 0.000175    | 20   | 0.000222    | 0.000206    | 7.5  | 0.00240     | 0.00242     | 0.83 |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050  | -    | <0.0000050  | <0.0000050  | -    | <0.0000050  | <0.0000050  | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000474    | 0.000497    | 4.7  | 0.000478    | 0.000487    | 1.9  | 0.000111    | 0.000118    | 6.1  |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00072     | 0.00077     | 6.7  | 0.00082     | 0.00079     | 3.7  | <0.00050    | <0.00050    | -    |
| Potassium (K)                             | mg/L     | 0.200     | 1.54        | 1.54        | 0    | 1.65        | 1.64        | 0.61 | 0.57        | 0.55        | 3.6  |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    |
| Silicon (Si)                              | mg/L     | 0.100     | 0.42        | 0.42        | 0    | 0.43        | 0.44        | 2.3  | 0.420       | 0.400       | 4.9  |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    | <0.000010   | <0.000010   | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 2.43        | 2.50        | 2.8  | 2.60        | 2.62        | 0.8  | 0.433       | 0.412       | 5.0  |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.0150      | 0.0149      | 0.67 | 0.0154      | 0.0157      | 1.9  | 0.00971     | 0.00910     | 6.5  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    | <0.00010    | <0.00010    | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    | <0.010      | <0.010      | -    |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.00130     | 0.00129     | 0.77 | 0.00140     | 0.00141     | 0.7  | 0.000309    | 0.000306    | 1.0  |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    | <0.0010     | <0.0010     | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | <0.0030     | 0.0035      | -    | <0.0030     | <0.0030     | -    | <0.0030     | <0.0030     | -    |
| Aggregate Organics (Water)                |          |           |             |             |      |             |             |      |             |             |      |
| Phenols (4AAP)                            | mg/L     | 0.00100   | <0.0010     | <0.0010     | -    | 0.0115      | <0.0010     | -    | <0.0010     | <0.0010     | -    |
| Plant Pigments (Water)                    |          |           |             |             |      |             |             |      |             |             |      |
| Chlorophyll a                             | µg/L     | 0.100     | 0.59        | 0.55        | 7.0  | 1.37        | 1.99        | 37   | 0.29        | 0.32        | 9.8  |
| Phaeophytin a                             | µg/L     | 0.100     | 0.54        | 0.49        | 9.7  | 0.68        | 0.94        | 32   | 0.34        | 0.35        | 2.9  |

Values exceeding the DQO of ≤ 25% RPD.

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. LDL = Laboratory Detection Limit, RPD = Relative Percent Difference, DQO = Data Quality Objective.



Figure A.4: Water Sample Field Duplicate Results with Reference to the Data Quality Objective, Mary River CREMP, 2020

| Sample ID                                 | Units    | LRL       | DLO-02-03-S | DLO-02-03-S01 | RPD  | BLO-03-S    | BLO-03-S01  | RPD  | FO-01      | FO-0101    | RPD  |
|-------------------------------------------|----------|-----------|-------------|---------------|------|-------------|-------------|------|------------|------------|------|
| Date Sampled                              |          |           | 28-Jul-2020 | 28-Jul-2020   |      | 31-Jul-2020 | 31-Jul-2020 |      | 1-Aug-2020 | 1-Aug-2020 |      |
| ALS Sample ID                             |          |           | L2480819-5  | L2480819-3    |      | L2482716-1  | L2482716-2  |      | L2482803-5 | L2482803-6 |      |
| Conductivity                              | umhos/cm | 3         | 131         | 132           | 0.76 | 78.0        | 77.7        | 0.39 | 345        | 347        | 0.58 |
| Hardness (as CaCO <sub>3</sub> )          | mg/L     | 10.0      | 63.1        | 63.1          | 0    | 35.3        | 33.9        | 4.0  | 166        | 164        | 1.2  |
| pH                                        | pH units | 0.100     | 8.24        | 8.21          | 0    | 7.89        | 7.82        | 0.89 | 8.30       | 8.30       | 0    |
| Total Suspended Solids                    | mg/L     | 2         | <2.0        | <2.0          | -    | <2.0        | <2.0        | -    | <2.0       | <2.0       | -    |
| Total Dissolved Solids                    | mg/L     | 20.0      | 69          | 76            | 10   | 46          | 43          | 6.7  | 190        | 195        | 2.6  |
| Turbidity                                 | NTU      | 0.100     | 0.72        | 0.81          | 12   | 1.13        | 1.15        | 1.8  | 0.41       | 0.40       | 2.5  |
| Anions and Nutrients (Water)              |          |           |             |               |      |             |             |      |            |            |      |
| Alkalinity, Total (as CaCO <sub>3</sub> ) | mg/L     | 10.0      | 50.6        | 49.7          | 1.8  | 44          | 43          | 2.3  | 122        | 121        | 0.82 |
| Ammonia, Total (as N)                     | mg/L     | 0.0200    | <0.0050     | <0.0050       | -    | <0.010      | <0.010      | -    | <0.010     | <0.010     | -    |
| Bromide (Br)                              | mg/L     | 0.100     | <0.050      | <0.050        | -    | <0.10       | <0.10       | -    | <0.10      | <0.10      | -    |
| Chloride (Cl)                             | mg/L     | 0.500     | 3.36        | 3.36          | 0    | 2.59        | 2.56        | 1.2  | 13.7       | 13.7       | 0    |
| Nitrate and Nitrite as N                  | mg/L     | 0.0210    | -           | -             | -    | <0.021      | <0.021      | -    | 0.714      | 0.715      | 0    |
| Nitrate (as N)                            | mg/L     | 0.0200    | 0.0781      | 0.0788        | 0.89 | <0.020      | <0.020      | -    | 0.714      | 0.715      | 0    |
| Nitrite (as N)                            | mg/L     | 0.00500   | 0.0014      | 0.0024        | 53   | <0.0050     | <0.0050     | -    | <0.0050    | <0.0050    | -    |
| Total Kjeldahl Nitrogen                   | mg/L     | 0.150     | 0.126       | 0.125         | 0.80 | <0.15       | <0.15       | -    | 0.32       | 0.40       | 22   |
| Phosphorus, Total                         | mg/L     | 0.00300   | 0.0085      | 0.0043        | 66   | 0.0032      | 0.0048      | 40   | <0.0030    | <0.0030    | -    |
| Sulfate (SO <sub>4</sub> )                | mg/L     | 0.300     | 9.66        | 9.68          | 0    | 1.60        | 1.65        | 3.1  | 36.0       | 36.0       | 0    |
| Organic / Inorganic Carbon (Water)        |          |           |             |               |      |             |             |      |            |            |      |
| Dissolved Organic Carbon                  | mg/L     | 0.500     | 1.56        | 1.67          | 6.8  | 2.36        | 2.57        | 8.5  | 1.69       | 1.73       | 2.3  |
| Total Organic Carbon                      | mg/L     | 0.500     | 1.79        | 1.62          | 10   | 2.02        | 3.02        | 40   | 2.74       | 2.83       | 3.2  |
| Total Metals (Water)                      |          |           |             |               |      |             |             |      |            |            |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | 0.0192      | 0.0194        | 1.0  | 0.0391      | 0.0266      | 38   | 0.0337     | 0.0348     | 3.2  |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00650     | 0.00648       | 0    | 0.00465     | 0.00435     | 6.7  | 0.0165     | 0.0157     | 5.0  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00010    | <0.00010      | -    | <0.00050    | <0.00050    | -    | <0.00010   | <0.00010   | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.000050   | <0.000050     | -    | <0.00050    | <0.00050    | -    | <0.000050  | <0.000050  | -    |
| Boron (B)                                 | mg/L     | 0.0100    | <0.010      | <0.010        | -    | <0.010      | <0.010      | -    | <0.010     | <0.010     | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.000010   | <0.000010   | -    | <0.0000050 | <0.0000050 | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 11.7        | 11.5          | 1.7  | 7.01        | 6.95        | 0.86 | 29.4       | 29.0       | 1.4  |
| Chromium (Cr)                             | mg/L     | 0.000500  | 0.00012     | 0.00010       | 18   | <0.00050    | <0.00050    | -    | <0.00050   | <0.00050   | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.00077     | 0.00075       | 2.6  | 0.00060     | 0.00058     | 3.4  | <0.0010    | <0.0010    | -    |
| Iron (Fe)                                 | mg/L     | 0.0300    | 0.023       | 0.024         | 4.3  | 0.041       | 0.036       | 13   | 0.028      | 0.030      | 6.9  |
| Lead (Pb)                                 | mg/L     | 0.0000500 | <0.000050   | <0.000050     | -    | <0.000050   | <0.000050   | -    | <0.000050  | <0.000050  | -    |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0011      | 0.0011        | 0    | <0.0010     | <0.0010     | -    | 0.0026     | 0.0027     | 3.8  |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 7.04        | 6.81          | 3.3  | 4.40        | 4.25        | 3.5  | 21.4       | 20.5       | 4.3  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.00335     | 0.00337       | 0.60 | 0.00184     | 0.00172     | 6.7  | 0.00103    | 0.00100    | 3.0  |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.0000050  | <0.0000050  | -    | <0.0000050 | <0.0000050 | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000662    | 0.000657      | 0.76 | 0.000114    | 0.000125    | 9.2  | 0.000491   | 0.000486   | 1.0  |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00063     | 0.00063       | 0    | <0.00050    | <0.00050    | -    | 0.00057    | 0.00051    | 11   |
| Potassium (K)                             | mg/L     | 0.200     | 1.04        | 1.01          | 2.9  | 0.58        | 0.55        | 5.3  | 1.81       | 1.75       | 3.4  |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.000050   | <0.000050     | -    | <0.0010     | <0.0010     | -    | 0.000070   | 0.000063   | 11   |
| Silicon (Si)                              | mg/L     | 0.100     | 0.48        | 0.48          | 0    | 0.45        | 0.41        | 9.3  | 1.00       | 1.05       | 4.9  |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    | <0.000050  | <0.000050  | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 1.40        | 1.36          | 2.9  | 1.34        | 1.24        | 7.8  | 3.23       | 3.09       | 4.4  |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.00897     | 0.00876       | 2.4  | 0.00584     | 0.00591     | 1.2  | 0.0414     | 0.0408     | 1.5  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.000010   | <0.000010     | -    | <0.00010    | <0.00010    | -    | <0.000010  | <0.000010  | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | 0.00081     | 0.00091       | 12   | <0.010      | <0.010      | -    | 0.00167    | 0.00185    | 10   |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.000931    | 0.00096       | 2.5  | 0.000642    | 0.000637    | 0.78 | 0.00369    | 0.00358    | 3.0  |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.00050    | <0.00050      | -    | <0.0010     | <0.0010     | -    | <0.00050   | <0.00050   | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | <0.0030     | <0.0030       | -    | <0.0030     | <0.0030     | -    | <0.0030    | 0.0059     | 65   |
| Dissolved Metals (Water)                  |          |           |             |               |      |             |             |      |            |            |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | 0.0091      | 0.0057        | 46   | 0.0111      | 0.0090      | 21   | 0.0067     | 0.0063     | 6.2  |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00677     | 0.00666       | 1.6  | 0.00444     | 0.00405     | 9.2  | 0.0168     | 0.0164     | 2.4  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00010    | <0.00010      | -    | <0.00050    | <0.00050    | -    | <0.00010   | <0.00010   | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.000050   | <0.000050     | -    | <0.00050    | <0.00050    | -    | <0.000050  | <0.000050  | -    |
| Boron (B)                                 | mg/L     | 0.0100    | 0.010       | 0.011         | 10   | <0.010      | <0.010      | -    | <0.010     | <0.010     | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.000010   | <0.000010   | -    | <0.0000050 | <0.0000050 | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 12.0        | 12.1          | 0.83 | 6.71        | 6.91        | 2.9  | 30.8       | 31.0       | 0.65 |
| Chromium (Cr)                             | mg/L     | 0.000500  | <0.00010    | <0.00010      | -    | <0.00050    | <0.00050    | -    | <0.00050   | <0.00050   | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.00072     | 0.00071       | 1.4  | 0.00058     | 0.00052     | 11   | 0.00100    | 0.00094    | 6.2  |
| Iron (Fe)                                 | mg/L     | 0.0300    | <0.010      | <0.010        | -    | <0.030      | <0.030      | -    | <0.010     | <0.010     | -    |
| Lead (Pb)                                 | mg/L     | 0.0000500 | <0.000050   | <0.000050     | -    | <0.000050   | <0.000050   | -    | <0.000050  | <0.000050  | -    |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0010      | 0.0011        | 10   | <0.0010     | <0.0010     | -    | 0.0032     | 0.0035     | 9.0  |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 8.06        | 7.96          | 1.2  | 4.51        | 4.04        | 11   | 21.6       | 21.1       | 2.3  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.00056     | 0.00055       | 1.8  | 0.000416    | 0.000342    | 20   | <0.00050   | <0.00050   | -    |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.0000050  | <0.0000050  | -    | <0.0000050 | <0.0000050 | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000593    | 0.000599      | 1.0  | 0.000109    | 0.000113    | 3.6  | 0.000561   | 0.000562   | 0.18 |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00051     | <0.00050      | 2.0  | <0.00050    | <0.00050    | -    | 0.00054    | 0.00051    | 5.7  |
| Potassium (K)                             | mg/L     | 0.200     | 1.07        | 1.06          | 0.94 | 0.63        | 0.52        | 19   | 1.83       | 1.78       | 2.8  |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.000050   | <0.000050     | -    | <0.0010     | <0.0010     | -    | 0.000082   | 0.000079   | 3.7  |
| Silicon (Si)                              | mg/L     | 0.100     | 0.407       | 0.415         | 1.9  | 0.39        | 0.39        | 0    | 1.10       | 1.10       | 0    |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    | <0.000050  | <0.000050  | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 1.55        | 1.48          | 4.6  | 1.36        | 1.21        | 12   | 3.32       | 3.21       | 3.4  |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.00850     | 0.00860       | 1.2  | 0.00562     | 0.00566     | 0.71 | 0.0430     | 0.0439     | 2.1  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.000010   | <0.000010     | -    | <0.00010    | <0.00010    | -    | 0.000010   | <0.000010  | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    | <0.00010   | <0.00010   | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | <0.00030    | <0.00030      | -    | <0.010      | <0.010      | -    | <0.00030   | <0.00030   | -    |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.000904    | 0.000885      | 2.1  | 0.000583    | 0.000604    | 3.5  | 0.00373    | 0.00371    | 0.54 |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.00050    | <0.00050      | -    | <0.0010     | <0.0010     | -    | <0.00050   | <0.00050   | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | <0.0010     | <0.0010       | -    | <0.0030     | <0.0030     | -    | <0.0010    | <0.0010    | -    |
| Aggregate Organics (Water)                |          |           |             |               |      |             |             |      |            |            |      |
| Phenols (4AAP)                            | mg/L     | 0.00100   | 0.0022      | 0.0025        | 13   | <0.0010     | <0.0010     | -    | <0.0010    | <0.0010    | -    |
| Plant Pigments (Water)                    |          |           |             |               |      |             |             |      |            |            |      |
| Chlorophyll a                             | µg/L     | 0.100     | 1.60        | 2.56          | 46   | 1.69        | 2.18        | 25   | 0.41       | 0.43       | 4.8  |
| Phaeophytin a                             | µg/L     | 0.100     | 1.93        | 2.37          | 20   | 1.48        | 1.68        | 13   | 1.02       | 1.05       | 2.9  |

Values exceeding the DQO of ≤ 25% RPD.

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. LDL = Laboratory Detection Limit, RPD = Relative Percent Difference, DQO = Data Quality Objective.

Figure A.4: Water Sample Field Duplicate Results with Reference to the Data Quality Objective, Mary River CREMP, 2020

| Sample ID                                 | Units    | LRL       | DLO-02-06-B | DLO-02-06-B01 | RPD  | BLO-01B-S   | BLO-01B-S01 | RPD  |
|-------------------------------------------|----------|-----------|-------------|---------------|------|-------------|-------------|------|
| Date Sampled                              |          |           | 26-Aug-2020 | 26-Aug-2020   |      | 27-Aug-2020 | 27-Aug-2020 |      |
| ALS Sample ID                             |          |           | L2494774-6  | L2494774-7    |      | L2495476-3  | L2495476-5  |      |
| Conductivity                              | umhos/cm | 3         | 142         | 141           | 0.71 | 217         | 229         | 5.4  |
| Hardness (as CaCO <sub>3</sub> )          | mg/L     | 10.0      | 68.7        | 67.5          | 1.8  | 106         | 105         | 0.95 |
| pH                                        | pH units | 0.100     | 8.03        | 8.01          | 0.25 | 8.18        | 8.22        | 0.49 |
| Total Suspended Solids                    | mg/L     | 2         | 2.6         | <2.0          | 26   | <2.0        | <2.0        | -    |
| Total Dissolved Solids                    | mg/L     | 20.0      | 75          | 75            | 0    | 129         | 133         | 3.1  |
| Turbidity                                 | NTU      | 0.100     | 2.16        | 2.27          | 5.0  | 0.67        | 0.77        | 14   |
| Anions and Nutrients (Water)              |          |           |             |               |      |             |             |      |
| Alkalinity, Total (as CaCO <sub>3</sub> ) | mg/L     | 10.0      | 56          | 57            | 1.8  | 96          | 98          | 2.1  |
| Ammonia, Total (as N)                     | mg/L     | 0.0200    | 0.011       | 0.011         | 0    | <0.010      | 0.028       | 95   |
| Bromide (Br)                              | mg/L     | 0.100     | <0.10       | <0.10         | -    | <0.10       | <0.10       | -    |
| Chloride (Cl)                             | mg/L     | 0.500     | 3.92        | 3.93          | 0.25 | 9.51        | 9.48        | 0.32 |
| Nitrate and Nitrite as N                  | mg/L     | 0.0210    | 0.079       | 0.082         | 3.7  | 0.037       | 0.038       | 2.7  |
| Nitrate (as N)                            | mg/L     | 0.0200    | 0.079       | 0.082         | 3.7  | 0.037       | 0.038       | 2.7  |
| Nitrite (as N)                            | mg/L     | 0.00500   | <0.0050     | <0.0050       | -    | <0.0050     | <0.0050     | -    |
| Total Kjeldahl Nitrogen                   | mg/L     | 0.150     | <0.15       | 0.19          | 24   | 0.17        | 0.19        | 11   |
| Phosphorus, Total                         | mg/L     | 0.00300   | 0.0079      | 0.0063        | 23   | 0.0066      | 0.0116      | 55   |
| Sulfate (SO <sub>4</sub> )                | mg/L     | 0.300     | 9.76        | 9.79          | 0    | 4.02        | 4.05        | 0.74 |
| Organic / Inorganic Carbon (Water)        |          |           |             |               |      |             |             |      |
| Dissolved Organic Carbon                  | mg/L     | 0.500     | 2.53        | 2.07          | 20   | 2.35        | 2.36        | 0    |
| Total Organic Carbon                      | mg/L     | 0.500     | 2.41        | 2.44          | 1.2  | 24.8        | 2.88        | 158  |
| Total Metals (Water)                      |          |           |             |               |      |             |             |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | 0.0585      | 0.0594        | 1.5  | 0.0178      | 0.0200      | 12   |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00767     | 0.00775       | 1.0  | 0.0107      | 0.0111      | 3.7  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Boron (B)                                 | mg/L     | 0.0100    | 0.012       | 0.013         | 8.0  | <0.010      | <0.010      | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 13.5        | 13.5          | 0    | 21.2        | 22.0        | 3.7  |
| Chromium (Cr)                             | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.000820    | 0.000800      | 2.5  | 0.00097     | 0.00098     | 1.0  |
| Iron (Fe)                                 | mg/L     | 0.0300    | 0.0610      | 0.0610        | 0    | <0.030      | <0.030      | -    |
| Lead (Pb)                                 | mg/L     | 0.0000500 | 0.0000550   | 0.0000510     | 7.5  | <0.000050   | <0.000050   | -    |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0014      | 0.0015        | 6.9  | 0.0013      | 0.0014      | 7.4  |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 8.35        | 8.53          | 2.1  | 12.5        | 12.7        | 1.6  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.00345     | 0.00328       | 5.1  | 0.00238     | 0.00237     | 0.42 |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.0000050  | <0.0000050  | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000645    | 0.000647      | 0.31 | 0.000317    | 0.000316    | 0.32 |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00060     | 0.00064       | 6.5  | <0.00050    | 0.00052     | 3.9  |
| Potassium (K)                             | mg/L     | 0.200     | 1.15        | 1.16          | 0.87 | 1.15        | 1.16        | 0.87 |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.0010     | <0.0010       | -    | <0.0010     | <0.0010     | -    |
| Silicon (Si)                              | mg/L     | 0.100     | 0.49        | 0.51          | 4.0  | 0.74        | 0.71        | 4.1  |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 1.75        | 1.71          | 2.3  | 4.38        | 4.35        | 0.69 |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.0101      | 0.0103        | 2.0  | 0.0166      | 0.0168      | 1.2  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | <0.010      | <0.010        | -    | <0.010      | <0.010      | -    |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.00121     | 0.00119       | 1.7  | 0.00348     | 0.00345     | 0.87 |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.0010     | <0.0010       | -    | <0.0010     | <0.0010     | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | <0.0030     | <0.0030       | -    | <0.0030     | <0.0030     | -    |
| Dissolved Metals (Water)                  |          |           |             |               |      |             |             |      |
| Aluminum (Al)                             | mg/L     | 0.00300   | 0.0132      | 0.0105        | 23   | 0.0045      | 0.0071      | 45   |
| Antimony (Sb)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Arsenic (As)                              | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Barium (Ba)                               | mg/L     | 0.0000500 | 0.00727     | 0.00724       | 0.41 | 0.0108      | 0.011       | 1.8  |
| Beryllium (Be)                            | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Bismuth (Bi)                              | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Boron (B)                                 | mg/L     | 0.0100    | 0.012       | 0.012         | 0    | <0.010      | <0.010      | -    |
| Cadmium (Cd)                              | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    |
| Calcium (Ca)                              | mg/L     | 0.0500    | 13.5        | 13.4          | 0.74 | 21.8        | 21.1        | 3.3  |
| Chromium (Cr)                             | mg/L     | 0.000500  | <0.00050    | <0.00050      | -    | <0.00050    | <0.00050    | -    |
| Cobalt (Co)                               | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Copper (Cu)                               | mg/L     | 0.000500  | 0.00075     | 0.00073       | 2.7  | 0.00096     | 0.00101     | 5.1  |
| Iron (Fe)                                 | mg/L     | 0.0300    | <0.030      | <0.030        | -    | <0.030      | <0.030      | -    |
| Lead (Pb)                                 | mg/L     | 0.0000500 | <0.000050   | <0.000050     | -    | <0.000050   | <0.000050   | -    |
| Lithium (Li)                              | mg/L     | 0.00100   | 0.0013      | 0.0013        | 0    | 0.0013      | 0.0012      | 8.0  |
| Magnesium (Mg)                            | mg/L     | 0.0500    | 8.48        | 8.29          | 2.3  | 12.5        | 12.8        | 2.4  |
| Manganese (Mn)                            | mg/L     | 0.0000700 | 0.000525    | 0.000518      | 1.3  | 0.000479    | 0.000547    | 13   |
| Mercury (Hg)                              | mg/L     | 0.0000100 | <0.0000050  | <0.0000050    | -    | <0.0000050  | <0.0000050  | -    |
| Molybdenum (Mo)                           | mg/L     | 0.0000500 | 0.000626    | 0.000643      | 2.7  | 0.000306    | 0.000322    | 5.1  |
| Nickel (Ni)                               | mg/L     | 0.000500  | 0.00052     | 0.00054       | 3.8  | <0.00050    | 0.00051     | 2.0  |
| Potassium (K)                             | mg/L     | 0.200     | 1.15        | 1.11          | 3.5  | 1.14        | 1.17        | 2.6  |
| Selenium (Se)                             | mg/L     | 0.00100   | <0.0010     | <0.0010       | -    | <0.0010     | <0.0010     | -    |
| Silicon (Si)                              | mg/L     | 0.100     | 0.41        | 0.38          | 7.6  | 0.7         | 0.72        | 2.8  |
| Silver (Ag)                               | mg/L     | 0.0000100 | <0.000010   | <0.000010     | -    | <0.000010   | <0.000010   | -    |
| Sodium (Na)                               | mg/L     | 0.0500    | 1.76        | 1.72          | 2.3  | 4.38        | 4.44        | 1.4  |
| Strontium (Sr)                            | mg/L     | 0.000100  | 0.0101      | 0.0100        | 1.0  | 0.0161      | 0.0167      | 3.7  |
| Thallium (Tl)                             | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Tin (Sn)                                  | mg/L     | 0.000100  | <0.00010    | <0.00010      | -    | <0.00010    | <0.00010    | -    |
| Titanium (Ti)                             | mg/L     | 0.0100    | <0.010      | <0.010        | -    | <0.010      | <0.010      | -    |
| Uranium (U)                               | mg/L     | 0.0000100 | 0.00117     | 0.00117       | 0    | 0.00341     | 0.00341     | 0    |
| Vanadium (V)                              | mg/L     | 0.00100   | <0.0010     | <0.0010       | -    | <0.0010     | <0.0010     | -    |
| Zinc (Zn)                                 | mg/L     | 0.00300   | <0.0030     | <0.0030       | -    | <0.0030     | <0.0030     | -    |
| Aggregate Organics (Water)                |          |           |             |               |      |             |             |      |
| Phenols (4AAP)                            | mg/L     | 0.00100   | <0.0010     | <0.0010       | -    | <0.0010     | 0.0073      | 152  |
| Plant Pigments (Water)                    |          |           |             |               |      |             |             |      |
| Chlorophyll a                             | µg/L     | 0.100     | 1.14        | 1.41          | 21   | 1.02        | 1.14        | 11   |
| Phaeophytin a                             | µg/L     | 0.100     | 0.68        | 0.92          | 30   | 0.82        | 0.86        | 4.8  |

Values exceeding the DQO of ≤ 25% RPD.

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. LDL = Laboratory Detection Limit, RPD = Relative Percent Difference, DQO = Data Quality Objective.

Table A.5: Proportion of Benthic Invertebrates Samples Sorted for the 2020 CREMP

(a) Lotic (creek and river) samples

| Station    | Fraction           | Station    | Fraction | Station    | Fraction | Station    | Fraction Sorted | Station    | Fraction |
|------------|--------------------|------------|----------|------------|----------|------------|-----------------|------------|----------|
| CLT1-US-B1 | Whole              | CLT1-DS-B2 | Whole    | CLT2-US-B3 | Whole    | CLT2-DS-B4 | Whole           | REF-CRK-B5 | Whole    |
| CLT1-US-B2 | Whole <sup>a</sup> | CLT1-DS-B3 | Whole    | CLT2-US-B4 | Whole    | CLT2-DS-B5 | Whole           | -          | -        |
| CLT1-US-B3 | 1/2 <sup>a</sup>   | CLT1-DS-B4 | Whole    | CLT2-US-B5 | Whole    | REF-CRK-B1 | Whole           | -          | -        |
| CLT1-US-B4 | Whole              | CLT1-DS-B5 | Whole    | CLT2-DS-B1 | 1/2      | REF-CRK-B2 | Whole           | -          | -        |
| CLT1-US-B5 | Whole              | CLT2-US-B1 | Whole    | CLT2-DS-B2 | Whole    | REF-CRK-B3 | Whole           | -          | -        |
| CLT1-DS-B1 | Whole              | CLT2-US-B2 | Whole    | CLT2-DS-B3 | Whole    | REF-CRK-B4 | Whole           | -          | -        |

(b) Lentic (lake) samples

| Station   | Fraction           | Station   | Fraction | Station   | Fraction           | Station   | Fraction Sorted    | Station | Fraction |
|-----------|--------------------|-----------|----------|-----------|--------------------|-----------|--------------------|---------|----------|
| REF-03-01 | Whole              | BLO-04    | Whole    | DLO-01-09 | 1/2                | DLO-02-10 | 1/2                | JLO-20  | Whole    |
| REF-03-02 | 1/2                | BLO-05    | 1/2      | DLO-01-10 | 1/2                | DLO-02-11 | 1/2                | JLO-21  | 1/2      |
| REF-03-03 | Whole              | BLO-06    | Whole    | DLO-01-11 | Whole              | DLO-02-12 | Whole              | -       | -        |
| REF-03-04 | Whole              | BLO-07    | Whole    | DLO-01-12 | Whole              | DLO-02-13 | Whole              | -       | -        |
| REF-03-05 | Whole              | BLO-11    | 1/2      | DLO-01-14 | 1/2                | JLO-01    | Whole              | -       | -        |
| REF-03-06 | Whole              | BLO-13    | Whole    | DLO-01-15 | Whole              | JLO-02    | 1/2                | -       | -        |
| REF-03-07 | Whole              | BLO-14    | Whole    | DLO-02-01 | Whole              | JLO-07    | Whole              | -       | -        |
| REF-03-08 | Whole              | BLO-15    | Whole    | DLO-02-02 | Whole              | JLO-11    | 1/2                | -       | -        |
| REF-03-09 | Whole              | DLO-01-02 | Whole    | DLO-02-03 | Whole              | JLO-12    | Whole              | -       | -        |
| REF-03-10 | Whole              | DLO-01-03 | 1/2      | DLO-02-04 | 1/2                | JLO-16    | Whole              | -       | -        |
| BLO-01    | Whole <sup>a</sup> | DLO-01-04 | 1/2      | DLO-02-08 | Whole              | JLO-18    | 1/2                | -       | -        |
| BLO-03    | Whole              | DLO-01-05 | Whole    | DLO-02-09 | Whole <sup>a</sup> | JLO-19    | Whole <sup>a</sup> | -       | -        |

<sup>a</sup> Two halves were sorted for subsampling error.

**QA/QC Notes:** Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group. Immatures were not 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 oligochaetes 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). Densities expressed per sampled area.

Table A.6: Subsampling Error for Benthic Invertebrate Community Samples, 2020 CREMP

(a) Lotic (creek and river) samples

| Station    | Whole Organisms | No. of Organisms in Fraction 1 | No. of Organisms in Fraction 2 | No. of Organisms in Fraction 3 | No. of Organisms in Fraction 4 | Actual Density* | Precision |   | Accuracy |     |
|------------|-----------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-----------------|-----------|---|----------|-----|
|            |                 |                                |                                |                                |                                |                 | % range   |   | min      | max |
| CLT1-US-B2 | -               | 282                            | 304                            | -                              | -                              | 586             | 7.2       | - | 3.8      | -   |

(b) Lentic (lake) samples

| Station   | Whole Organisms | No. of Organisms in Fraction 1 | No. of Organisms in Fraction 2 | No. of Organisms in Fraction 3 | No. of Organisms in Fraction | Actual Density* | Precision |   | Accuracy |     |
|-----------|-----------------|--------------------------------|--------------------------------|--------------------------------|------------------------------|-----------------|-----------|---|----------|-----|
|           |                 |                                |                                |                                |                              |                 | % range   |   | min      | max |
| BLO-01    | 0               | 285                            | 286                            | -                              | -                            | 571             | 0.3       | - | 0.2      | -   |
| DLO-02-09 | 0               | 315                            | 324                            | -                              | -                            | 639             | 2.8       | - | 1.4      | -   |
| JLO-19    | 0               | 306                            | 329                            | -                              | -                            | 635             | 7.0       | - | 3.6      | -   |

Notes: whole large organisms excluded in calculations; min = minimum absolute % error; max = maximum absolute % error.

Table A.7: Percent Recovery from Benthic Invertebrate Samples, Mary River Project CREMP, 2020

(a) Lotic (creek and river) samples

| Station            | Number of Organisms Recovered | Number of Organisms in Re-sort | Percent Recovery |
|--------------------|-------------------------------|--------------------------------|------------------|
| CLT1-US-B5         | 278                           | 300                            | 92.7%            |
| CLT2-US-B3         | 307                           | 314                            | 97.8%            |
| REF-CRK-B5         | 160                           | 168                            | 95.2%            |
| SDLT1-R1-B2        | 235                           | 237                            | 99.2%            |
| GO-03-B1           | 42                            | 43                             | 97.7%            |
| GO-09-B2           | 97                            | 98                             | 99.0%            |
| Average % Recovery |                               |                                | 96.9%            |

Notes: All samples were sorted in their entirety. The Chironomidae genera of *Pseudosmittia* has been split into *Pseudosmittia* and *Hydrosmittia*.

**QA/QC Notes (all sampling areas):** Pupae were not counted toward total number of taxa unless they were the sole representative of their taxa group. Immatures were not 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 oligochaetes 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). Densities expressed per sampled area.

(b) Lentic (lake) samples

| Station            | Number of Organisms Recovered | Number of Organisms in Re-sort | Percent Recovery |
|--------------------|-------------------------------|--------------------------------|------------------|
| BLO-01             | 568                           | 571                            | 99.5%            |
| DLO-01-05          | 95                            | 96                             | 99.0%            |
| DLO-02-08          | 350                           | 351                            | 99.7%            |
| DLO-02-12          | 383                           | 387                            | 99.0%            |
| JLO-16             | 188                           | 195                            | 96.4%            |
| Average % Recovery |                               |                                | 98.7%            |

## A3 DATA QUALITY STATEMENT

The DQR results generally indicated that the water and benthic invertebrate community data were of acceptable quality. Few water quality parameters did not meet acceptable DQO. In general, most parameters that did not meet respective DQO typically showed very low margins of error relative to respective criteria and/or were observed at low concentrations often near LRL which led to relatively small incremental differences in concentrations between replicates resulting in failure to meet DQO. The benthic invertebrate community data quality was also acceptable, meeting all precision, accuracy, and percent recovery benchmarks. Overall, the data associated with the 2020 CREMP were considered defensible and acceptable for interpretation and derivation of conclusions with a good level of confidence.



**APPENDIX B**  
**REFERENCE AREA DESCRIPTIVE OVERVIEW**

## APPENDIX B OVERVIEW OF REFERENCE CONDITIONS

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## B1 INTRODUCTION

The initial review of background (reference) data collected from lotic (i.e., creeks and rivers) and lentic (i.e., lakes) study areas as part of the 2015 Mary River Project CREMP revealed naturally elevated metal concentrations above guidelines and significant differences in benthic community endpoints between reference lake littoral and profundal habitats (Minnow 2016a). Therefore, this overview of reference conditions is included to provide context and perspective regarding water quality, sediment quality, phytoplankton (chlorophyll-a), benthic invertebrate community, and fish population characteristics at the CREMP reference study areas. Key implications of reference area features towards the evaluation of potential mine-related effects at mine-exposed waterbodies were also identified as part of this reference area overview.





## B2 HABITAT

### B2.1 Creek/Tributary Environments

Four reference creek/tributary (reference creek) stations were established among two unnamed tributaries to Angajurjualuk Lake (Stations CLT-REF4, MRY-REF2, and MRY-REF3) and one unnamed tributary to Mary River (Station CLT-REF3) during the Mary River Project CREMP in 2014 (see Figure 2.2). These stations were intended to provide reference information for the creek water quality and phytoplankton monitoring components of the CREMP, and have been used as such in the six studies conducted since commercial mine operations commenced at the Mary River Project (i.e., 2015 to 2020; see Table 2.1). From 2016 to 2020, habitat conditions at the western tributary to Angajurjualuk Lake that is used for Baffinland CREMP water quality monitoring (Stations CLT-REF4 and MRY-REF) were deemed comparable to habitat conditions at the Camp Lake and Sheardown Lake tributaries. Therefore, this tributary served as a benthic reference creek (REF-CRK) for comparisons involving the various mine-exposed tributaries as part of the 2016 to 2020 annual CREMP studies (see Figure 2.4), and herein has been referred to as Unnamed Reference Creek.

The reference creeks/tributaries are moderate gradient lotic systems characterized predominantly by riffle-run and riffle-rapid stream morphology, with pools occurring rarely reflecting localized topography and associated gradient. The wetted width and depth of the benthic reference tributary averaged 11.1 m and 0.09 m, respectively, during sampling conducted in August 2017 (Minnow 2018a). The corresponding water velocities across a representative riffle area of the benthic reference tributary ranged from 0.02 to 0.52 m/s in August 2017 (average of 0.28 m/s; Minnow 2018a). As for most small lotic systems in the region, surface flow at all of the CREMP reference tributaries is limited to months in which average ambient air temperatures are near or above freezing (i.e., June to September). The substrate at the reference tributaries is composed mainly of cobble and large pebble (i.e., 50 to 256 mm diameter), with surficial areas of sand generally limited to less than 10% of stream area (Minnow 2018a). In-stream vegetation at the reference tributaries is sparse, and generally includes a relatively thin layer of surficial algae/periphyton attached to relatively stable substrate.

### B2.2 River Environments

The area of Mary River located upstream of the mine lease property is only minimally influenced by Mary River Project mining activity (i.e., low amounts of dust deposition; see Baffinland 2015). Therefore, this area has been considered representative of background



(reference) conditions for the mine-exposed stations/study areas situated farther downstream on the Mary River under the CREMP (Baffinland 2015; KP 2014a,b, 2015; NSC 2014). Water quality, phytoplankton productivity, and benthic invertebrate community (benthic) data collected at the Mary River reference area, referred to as G0-09 (including water quality stations G0-09A, G0-09 and G0-09B), has been used in comparisons to areas of the Mary River that are potentially influenced by mine activity. Mary River study area G0-03 also currently serves as a reference area, but potential advancement of the Mary River Project to include the Deposit 2 ore body would result in this area becoming a near-field mine-exposed area in the future.

The Mary River reference area is a moderate gradient erosional environment characterized mainly by riffle and run stream morphology. Depending on flow conditions, average wetted width and average depth of the Mary River reference area has ranged from 30 to 55 m and 0.20 to 0.36 m, respectively, in studies conducted by Minnow (2017, 2018a) during the month of August. On average, the corresponding water velocities across representative riffle areas of the G0-09 benthic study area have ranged from 0.20 to 0.47 m/s during these studies. The substrate at the G0-09 reference area is composed mainly of boulder and cobble, with roughly equal proportion of pebble, gravel, and sand composing the surficial substrate at much of the remaining area (Minnow 2018a). In-stream vegetation at the Mary River G0-09 reference area is sparse, and generally includes a relatively thin layer of periphyton and/or scarce bryophytes (moss) growth on the upper surface of physically stable substrate.

### **B2.3 Lake Environments**

A geographically expansive reconnaissance survey of local study area (LSA) lakes was conducted in 2014 to identify a waterbody that could potentially serve as a suitable reference area for the mine-exposed lakes (i.e., Camp, Sheardown NW, Sheardown SE, and Mary lakes; NSC 2015). The key criteria for the selection of the suitable reference lake included a waterbody with similar surface area, maximum water depth, substrate features, and fish species composition as the mine-exposed lakes, in addition to also being uninfluenced by current or past mining activity. Based on the results of this survey, Reference Lake 3 was selected to represent reference conditions for the mine-exposed lakes beginning in 2015 as part of the Mary River Project CREMP studies (Appendix Table B.1).

Reference Lake 3 is an unnamed lake located approximately 62 km south of the Mary River Project (see Figures 2.1 and 2.3), well outside the area of mine influence. Reference Lake 3 is a headwater lake that is characterized by a relatively complex morphology that includes three basins and connection to a separate lake by a short, shallow channel (see Figure 2.3). The three basins reach approximately 15 m, 30 m, and 36 m in depth with



progression from east to west, and the average depth of Reference Lake 3 is approximately 11.8 m (Appendix Table B.1). The outlet of Reference Lake 3, located off the south-central portion of the lake, drains into a large boulder field through which flow can occur largely as sub-surface drainage. Substrate along the shoreline and shallow littoral areas of Reference Lake 3 is composed mainly of large boulder and cobble that is commonly interrupted by areas of bedrock. Substrate of the deeper littoral and profundal areas of Reference Lake 3 is almost exclusively represented by silt loam containing approximately 15 to 35% fine sand (by dry weight) and a moderate organic carbon content of approximately 5%. No substantial aquatic plant beds have been observed at Reference Lake 3, with fish cover provided predominantly by the rocky substrates along the shoreline and shallow littoral zone of the lake.

**Table B.1: Physical Characteristics for Mine-Exposed Lakes and Reference Lake 3**

| Lake Feature                           | Mine-Exposed Lakes |              |              |         | Reference Lake   |
|----------------------------------------|--------------------|--------------|--------------|---------|------------------|
|                                        | Camp               | Sheardown NW | Sheardown SE | Mary    | Reference Lake 3 |
| Drainage Basin Area (km <sup>2</sup> ) | 26.5               | 6.6          | 8.9          | 663.4   | 23.2             |
| Lake Area (km <sup>2</sup> )           | 2.21               | 0.68         | 0.25         | 13.6    | 2.05             |
| Drainage Basin: Lake Area Ratio        | 11.98              | 9.66         | 35.6         | 48.8    | 11.32            |
| Mean Depth (m)                         | 13.0               | 12.1         | 7.4          | -       | 11.8             |
| Maximum Depth (m)                      | 35.1               | 30.1         | 14.8         | 40.0    | 38.3             |
| Volume (1,000,000 m <sup>3</sup> )     | 27.5               | 8.18         | 1.8          | 156.4   | 22.6             |
| Hydraulic Retention Time (days)        | 416 ± 184          | 511 ± 213    | 83 ± 35      | 75 ± 29 | -                |



## B3 WATER QUALITY

### B3.1 Creek/Tributary Environments

Water chemistry at the reference creek stations met most applicable WQG and AEMP benchmarks for lotic environments in 2020, the exceptions to which included concentrations of total aluminum, total copper, and total iron (Appendix Table B.2). Concentrations of aluminum were elevated at reference creek station MRY-REF3 during spring, summer, and fall monitoring events in 2020 (Appendix Table B.2). Total copper and total iron concentrations were also elevated at station MRY-REF3 during the summer monitoring event. As reported in past studies, the occurrence of elevated concentrations of aluminum and iron at the reference creek stations appeared to be associated with naturally high turbidity at the time that samples were collected (Appendix Table B.2), which suggested that elevated turbidity and a corresponding elevation in aluminum and iron concentrations occur naturally in regional watercourses.

Water chemistry at the reference creek stations showed distinct seasonal changes for some parameters (Appendix Figure B.1; Appendix Table B.2). In general, conductivity and concentrations of conductivity, chloride, sulphate and metals were lowest in spring, intermediate in the summer, and highest during the fall in 2020 (Appendix Table B.2; Appendix Figure B.1). This pattern almost certainly reflected dilution from snow melt and precipitation-related sources, with the lowest parameter concentrations typically associated with the spring freshet conditions, and highest parameter concentrations generally associated with low precipitation/streamflow conditions later in the open water season. Previous baseline and 2015 to 2019 water quality monitoring conducted at reference creek stations showed similar seasonal patterns (KP 2014b; Minnow 2016a, 2017, 2018a, 2019, 2020). Temporal comparison of mean water chemistry for the reference creek stations indicated that water chemistry at the reference creek stations was relatively consistent year-to-year taking seasonal sampling timing into account for most parameters (Appendix Figure C.2), with higher parameter concentrations occurring during periods of low flow. Overall, the reference creek stations were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on water chemistry at mine-exposed creek/tributary receiving environments taking seasonality into consideration.

### B3.2 River Environments

Water chemistry at the Mary River reference stations (G0-09 series) showed elevated concentrations of total aluminum, copper, iron, lead, zinc, and phosphorus at one or more stations during at least one monitoring event in spring, summer, and fall 2020 compared to



Table B.2: Water Chemistry at Reference Creek Stations, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark | Spring Sampling Event |            |              |            | Summer Sampling Event |            |               |            | Fall Sampling Event |             |              |             |
|---------------------------|------------------------------------|---------|--------------------------------------------|----------------|-----------------------|------------|--------------|------------|-----------------------|------------|---------------|------------|---------------------|-------------|--------------|-------------|
|                           |                                    |         |                                            |                | CLT-REF4              | CLT-REF3   | MRY-REF3     | MRY-REF2   | CLT-REF4              | CLT-REF3   | MRY-REF3      | MRY-REF2   | CLT-REF4            | CLT-REF3    | MRY-REF3     | MRY-REF2    |
|                           |                                    |         |                                            |                | 4-Jul-2020            | 4-Jul-2020 | 4-Jul-2020   | 4-Jul-2020 | 3-Aug-2020            | 3-Aug-2020 | 3-Aug-2020    | 3-Aug-2020 | 29-Aug-2020         | 29-Aug-2020 | 29-Aug-2020  | 29-Aug-2020 |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -              | 61.0                  | 59.5       | 35.6         | 62.2       | 148                   | 126        | 121           | 141        | 186                 | 164         | 173          | 178         |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -              | 7.83                  | 7.79       | 7.18         | 7.70       | 8.12                  | 7.93       | 7.86          | 8.13       | 8.17                | 8.02        | 7.89         | 8.12        |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -              | 27.8                  | 27.4       | 12.4         | 26.8       | 66.3                  | 57.8       | 44.3          | 59.8       | 93.7                | 83.8        | 67.4         | 85.5        |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -              | <2.0                  | <2.0       | 6.8          | <2.0       | <2.0                  | <2.0       | 4.8           | <2.0       | <2.0                | <2.0        | <2.0         | <2.0        |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -              | 96                    | 88         | 69           | 87         | 89                    | 79         | 88            | 82         | 105                 | 88          | 108          | 95          |
|                           | Turbidity                          | NTU     | -                                          | -              | 1.06                  | 0.49       | 5.16         | 0.77       | 0.29                  | 0.74       | 24.3          | 1.15       | 0.37                | 0.40        | 7.82         | 1.36        |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -              | 29                    | 28         | <10          | 29         | 73                    | 67         | 39            | 65         | 88                  | 74          | 39           | 74          |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855          | <0.010                | <0.010     | <0.010       | <0.010     | <0.010                | <0.010     | 0.019         | <0.010     | <0.010              | <0.010      | <0.010       | <0.010      |
|                           | Nitrate                            | mg/L    | 3                                          | 3              | <0.020                | <0.020     | <0.020       | <0.020     | 0.045                 | 0.046      | 0.126         | 0.029      | 0.038               | 0.109       | 0.128        | 0.028       |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06           | <0.0050               | <0.0050    | <0.0050      | <0.0050    | <0.0050               | <0.0050    | <0.0050       | <0.0050    | <0.0050             | <0.0050     | <0.0050      | <0.0050     |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -              | <0.021                | <0.021     | <0.021       | <0.021     | <0.15                 | <0.15      | <0.15         | <0.15      | <0.15               | <0.15       | <0.15        | <0.15       |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -              | 1.71                  | 2.13       | 1.80         | 2.06       | 1.81                  | 4.90       | 4.27          | 2.79       | 1.83                | 2.66        | 2.12         | 2.62        |
|                           | Total Organic Carbon               | mg/L    | -                                          | -              | 1.97                  | 2.34       | 2.26         | 2.33       | 2.26                  | 3.54       | 3.06          | 3.35       | 1.95                | 2.32        | 1.86         | 2.42        |
|                           | Total Phosphorus                   | mg/L    | 0.020 <sup>α</sup>                         | -              | <0.0030               | <0.0030    | 0.0091       | <0.0030    | <0.0030               | <0.0030    | 0.0169        | <0.0030    | <0.0030             | <0.0030     | 0.0066       | <0.0030     |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -              | <0.0010               | <0.0010    | <0.0010      | <0.0010    | <0.0010               | <0.0010    | <0.0010       | <0.0010    | 0.0031              | <0.0010     | 0.0032       | <0.0010     |
|                           | Bromide (Br)                       | mg/L    | -                                          | -              | <0.10                 | <0.10      | <0.10        | <0.10      | <0.10                 | <0.10      | <0.10         | <0.10      | <0.10               | <0.10       | <0.10        | <0.10       |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120            | 0.51                  | 0.53       | 2.32         | 1.51       | 1.57                  | 1.37       | 8.69          | 4.64       | 2.27                | 2.33        | 16.0         | 7.76        |
| Anions                    | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218            | 0.68                  | 0.89       | 2.75         | 0.90       | 2.87                  | 3.78       | 11.8          | 3.64       | 4.93                | 7.62        | 19.0         | 5.43        |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179          | 0.0508                | 0.0221     | <b>0.202</b> | 0.0351     | 0.0096                | 0.0228     | <b>1.16</b>   | 0.0501     | 0.0170              | 0.0166      | <b>0.137</b> | 0.0666      |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -              | <0.00010              | <0.00010   | <0.00010     | <0.00010   | <0.00010              | <0.00010   | <0.00010      | <0.00010   | <0.00010            | <0.00010    | <0.00010     | <0.00010    |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005          | <0.00010              | <0.00010   | <0.00010     | <0.00010   | <0.00010              | <0.00010   | 0.00021       | <0.00010   | <0.00010            | <0.00010    | <0.00010     | <0.00010    |
|                           | Barium (Ba)                        | mg/L    | -                                          | -              | 0.00289               | 0.00342    | 0.00491      | 0.00327    | 0.00595               | 0.00674    | 0.0169        | 0.00834    | 0.00719             | 0.00844     | 0.0153       | 0.0103      |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -              | <0.00050              | <0.00050   | <0.00050     | <0.00050   | <0.00050              | <0.00050   | <0.00010      | <0.00050   | <0.00050            | <0.00050    | <0.00050     | <0.00050    |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -              | <0.00050              | <0.00050   | <0.00050     | <0.00050   | <0.00050              | <0.00050   | <0.000050     | <0.00050   | <0.00050            | <0.00050    | <0.00050     | <0.00050    |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -              | <0.010                | <0.010     | <0.010       | <0.010     | <0.010                | <0.010     | <0.010        | <0.010     | <0.010              | <0.010      | <0.010       | <0.010      |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008        | <0.000010             | <0.000010  | <0.000010    | <0.000010  | <0.000010             | <0.000010  | <0.0000050    | <0.000010  | <0.000010           | <0.000010   | <0.000010    | <0.000010   |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -              | 5.85                  | 5.47       | 2.74         | 5.44       | 13.9                  | 11.3       | 9.05          | 12.9       | 18.5                | 16.2        | 14.0         | 17.1        |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089         | <0.00050              | <0.00050   | <0.00050     | <0.00050   | <0.00050              | <0.00050   | 0.00178       | <0.00050   | <0.00050            | <0.00050    | <0.00050     | <0.00050    |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004          | <0.00010              | <0.00010   | <0.00010     | <0.00010   | <0.00010              | <0.00010   | 0.00033       | <0.00010   | <0.00010            | <0.00010    | <0.00010     | <0.00010    |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022         | <0.00050              | 0.00089    | 0.00084      | 0.00062    | 0.00057               | 0.00114    | <b>0.0022</b> | 0.00068    | 0.00064             | 0.00130     | 0.00140      | 0.00075     |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326          | <0.030                | <0.030     | 0.217        | <0.030     | <0.030                | 0.044      | <b>0.856</b>  | 0.040      | <0.030              | 0.031       | 0.160        | 0.044       |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001          | <0.000050             | 0.000083   | 0.000245     | <0.000050  | <0.000050             | 0.000090   | 0.000714      | <0.000050  | <0.000050           | <0.000050   | 0.000218     | <0.000050   |
|                           | Lithium (Li)                       | mg/L    | -                                          | -              | <0.0010               | <0.0010    | <0.0010      | <0.0010    | <0.0010               | <0.0010    | 0.0013        | <0.0010    | <0.0010             | <0.0010     | <0.0010      | <0.0010     |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -              | 3.32                  | 3.31       | 1.50         | 3.31       | 7.79                  | 7.04       | 4.72          | 7.22       | 10.7                | 10.1        | 7.20         | 10.3        |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -              | 0.000397              | 0.000485   | 0.00377      | 0.000777   | 0.000099              | 0.00115    | 0.00991       | 0.000839   | 0.000106            | 0.00100     | 0.00200      | 0.000957    |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -              | <0.0000050            | <0.0000050 | <0.0000050   | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050    | <0.0000050 | <0.0000050          | <0.0000050  | <0.0000050   | <0.0000050  |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -              | 0.000096              | 0.000303   | 0.000112     | 0.000082   | 0.000372              | 0.000708   | 0.000473      | 0.000264   | 0.000507            | 0.000895    | 0.000563     | 0.000332    |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025          | <0.00050              | <0.00050   | <0.00050     | <0.00050   | <0.00050              | 0.00067    | 0.00111       | <0.00050   | <0.00050            | 0.00076     | <0.00050     | <0.00050    |
|                           | Potassium (K)                      | mg/L    | -                                          | -              | 0.40                  | 0.44       | 0.52         | 0.45       | 0.69                  | 0.74       | 1.39          | 0.89       | 0.82                | 0.96        | 1.33         | 1.06        |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -              | <0.0010               | <0.0010    | <0.0010      | <0.0010    | <0.0010               | <0.0010    | <0.000050     | <0.0010    | <0.0010             | <0.0010     | <0.0010      | <0.0010     |
|                           | Silicon (Si)                       | mg/L    | -                                          | -              | 0.57                  | 0.63       | 0.78         | 0.49       | 0.66                  | 0.92       | 2.56          | 0.87       | 0.59                | 0.91        | 1.13         | 0.85        |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001         | <0.000010             | <0.000010  | <0.000010    | <0.000010  | <0.000010             | <0.000010  | <0.000050     | <0.000010  | <0.000010           | <0.000010   | <0.000010    | <0.000010   |
|                           | Sodium (Na)                        | mg/L    | -                                          | -              | 0.598                 | 0.585      | 1.15         | 0.995      | 2.35                  | 1.60       | 4.34          | 2.75       | 3.23                | 2.09        | 6.53         | 4.02        |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -              | 0.00468               | 0.00384    | 0.00634      | 0.00467    | 0.0116                | 0.00824    | 0.0229        | 0.0129     | 0.0154              | 0.0114      | 0.0310       | 0.0162      |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008         | <0.00010              | <0.00010   | <0.00010     | <0.00010   | <0.00010              | <0.00010   | 0.000023      | <0.00010   | <0.00010            | <0.00010    | <0.00010     | <0.00010    |
|                           | Tin (Sn)                           | mg/L    | -                                          | -              | <0.00010              | <0.00010   | <0.00010     | <0.00010   | <0.00010              | <0.00010   | <0.00010      | <0.00010   | <0.00010            | <0.00010    | <0.00010     | <0.00010    |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -              | <0.010                | <0.010     | 0.013        | <0.010     | <0.010                | <0.010     | 0.0665        | <0.010     | <0.010              | <0.010      | <0.010       | <0.010      |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -              | 0.000509              | 0.000450   | 0.000491     | 0.000331   | 0.00802               | 0.00414    | 0.00180       | 0.00222    | 0.0138              | 0.00849     | 0.00337      | 0.00381     |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006          | <0.0010               | <0.0010    | <0.0010      | <0.0010    | <0.0010               | <0.0010    | 0.00161       | <0.0010    | <0.0010             | <0.0010     | <0.0010      | <0.0010     |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030          | <0.0030               | <0.0030    | <0.0030      | <0.0030    | <0.0030               | <0.0030    | <0.0030       | <0.0030    | <0.0030             | <0.0030     | <0.0030      | <0.0030     |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**

Indicates parameter concentration above AEMP benchmark applicable to the mine lotic receiving environments.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]) and β (British Columbia Water Quality Guideline [BCWQG]). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intinsik (2013) using background water quality data. The values are specific to the Camp Lake system.

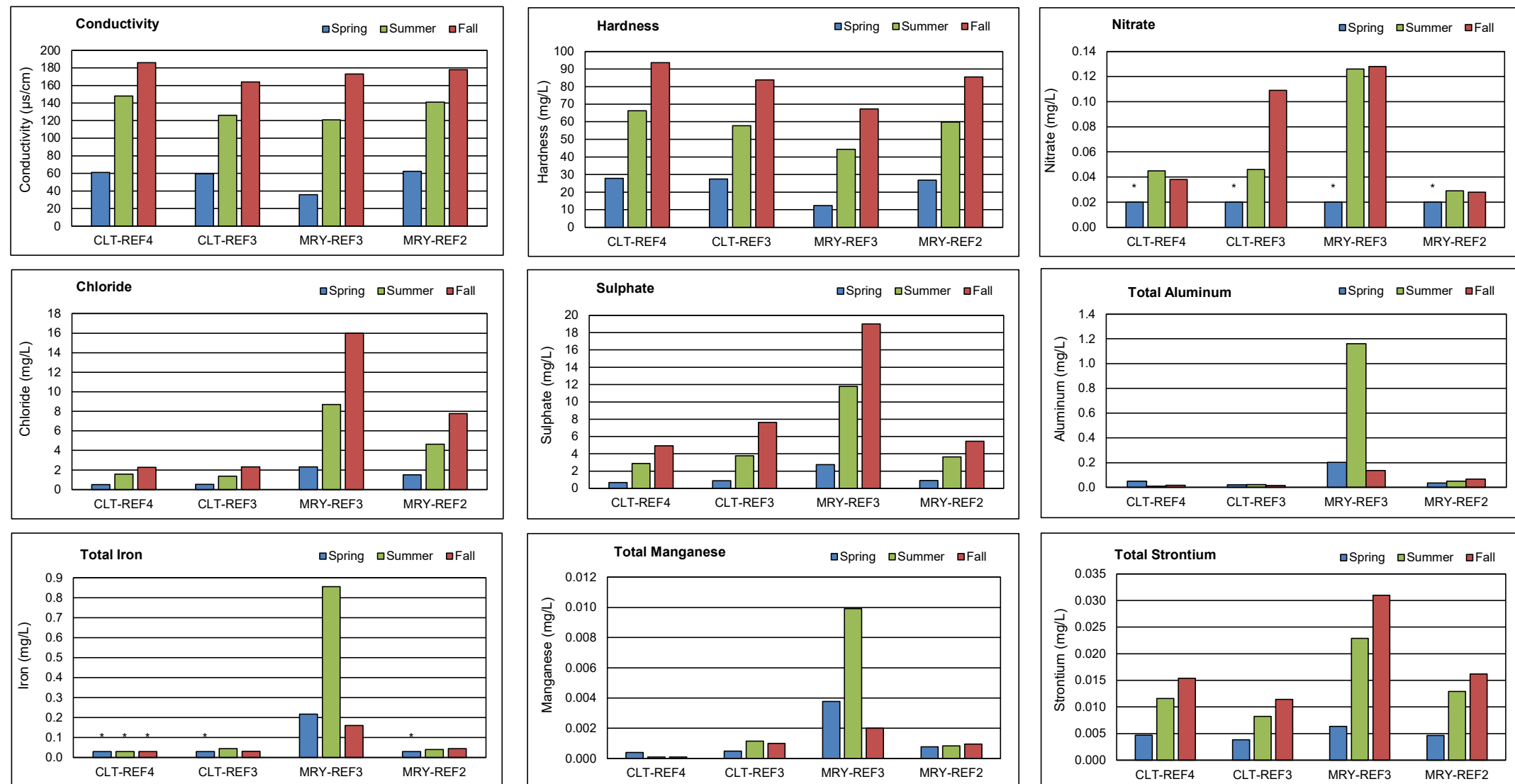


**Figure B.1: Seasonal Variation in Water Chemistry at Stream/Tributary Reference Stations, Mary River Project CREMP, 2020**

Note: Asterisk (\*) indicates that the parameter concentration was below the laboratory reportable detection limit.

WQG and/or AEMP benchmarks (Appendix Table B.3). As in previous CREMP studies, the WQG and/or AEMP benchmarks for aluminum and iron were generally exceeded at the Mary River reference area under highly turbid conditions (i.e.,  $\geq 5$  NTU), with the magnitude of elevation appearing to correlate closely with higher turbidity (Appendix Table B.3). Comparison of the ratio between dissolved and total concentrations of aluminum indicated that a high proportion of aluminum was in the total (particulate) fraction (compare Appendix Tables B.3 and C.60), which can be expected for metals associated with suspended particulate matter. Therefore, naturally high turbidity (and specifically, the chemical composition of suspended particulate matter) within the Mary River system can be expected to result in total concentrations of metals such as aluminum and iron being above WQG and/or AEMP benchmarks.

Water chemistry at the Mary River reference stations showed distinct seasonal changes for conservative parameters including conductivity, hardness, chloride, sodium, and sulphate (Appendix Figure B.2; Appendix Table B.3). These seasonal changes in parameter concentrations were consistent with those observed at the reference creek stations in 2020, and in previous baseline (2005 to 2013), and 2015 to 2019 water quality monitoring data collected at the Mary River G0-09 series reference stations (KP 2014b; Minnow 2016a, 2017, 2018a, 2019, 2020). The seasonal changes in the Mary River reference station parameter concentrations likely reflected greater dilution during the spring snowmelt period, and consecutively lower surface runoff inputs during the summer and fall periods. Temporal comparison of the Mary River G0-09 series reference station water chemistry indicated that concentrations of chloride, iron, molybdenum, nickel, and uranium were elevated at the G0-09 series stations in 2020 compared to baseline and most previous years of mine operation (Appendix Figure C.23). Higher concentrations of these parameters in fall 2020 potentially reflected a drier than normal fall season, and corroborated that higher parameter concentrations may occur naturally during periods of low flow. Overall, the Mary River reference stations were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on water chemistry at the Mary River mine-exposed study areas taking seasonality into consideration.

### **B3.3 Lake Environments (Reference Lake 3)**

*In situ* water temperature profiles conducted at Reference Lake 3 indicated thermally stratified conditions in the summer and fall of 2020 (Appendix Figure B.3). During the summer, the epilimnion extended to approximately 5 m below surface and the hypolimnion was established at depths greater than approximately 11 m, whereas in the fall, the corresponding depths for the epilimnion and hypolimnion were approximately the upper 21 m and depths below





Table B.3: Water Chemistry at Mary River GO-09 Series Reference Stations, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark | Spring Sampling Event |                     |                       | Summer Sampling Event |                     |                       | Fall Sampling Event    |                      |                        |
|---------------------------|------------------------------------|---------|--------------------------------------------|----------------|-----------------------|---------------------|-----------------------|-----------------------|---------------------|-----------------------|------------------------|----------------------|------------------------|
|                           |                                    |         |                                            |                | G0-09-A<br>4-Jul-2020 | G0-09<br>4-Jul-2020 | G0-09-B<br>4-Jul-2020 | G0-09-A<br>3-Aug-2020 | G0-09<br>2-Aug-2020 | G0-09-B<br>2-Aug-2020 | G0-09-A<br>28-Aug-2020 | G0-09<br>28-Aug-2020 | G0-09-B<br>28-Aug-2020 |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -              | 72.0                  | 67.2                | 44.4                  | 189                   | 190                 | 180                   | 252                    | 250                  | 243                    |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -              | 7.83                  | 7.83                | 7.55                  | 8.22                  | 8.23                | 8.22                  | 8.34                   | 8.37                 | 8.29                   |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -              | 32.5                  | 31.7                | 19                    | 84.4                  | 83.2                | 75.7                  | 126                    | 123                  | 110                    |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -              | <2.0                  | <2.0                | <2.0                  | 6.8                   | 21.2                | 9.8                   | <2.0                   | <2.0                 | 2.4                    |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -              | 60                    | 69                  | 70                    | 114                   | 93                  | 83                    | 134                    | 127                  | 127                    |
|                           | Turbidity                          | NTU     | -                                          | -              | 1.17                  | 2.60                | 9.05                  | 16.3                  | 37.2                | 25.5                  | 0.36                   | 3.06                 | 4.96                   |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -              | 35                    | 32                  | 21                    | 84                    | 80                  | 76                    | 111                    | 105                  | 94                     |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855          | <0.010                | <0.010              | 0.011                 | <0.010                | <0.010              | <0.010                | <0.010                 | <0.010               | <0.010                 |
|                           | Nitrate                            | mg/L    | 3                                          | 3              | <0.020                | <0.020              | 0.022                 | 0.139                 | 0.156               | 0.145                 | 0.026                  | 0.103                | 0.180                  |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06           | <0.0050               | <0.0050             | <0.0050               | <0.0050               | <0.0050             | <0.0050               | <0.0050                | <0.0050              | <0.0050                |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -              | <0.021                | <0.021              | 0.022                 | <0.15                 | 0.16                | <0.15                 | <0.15                  | <0.15                | <0.15                  |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -              | 1.84                  | 1.56                | 1.50                  | 3.68                  | 4.53                | 3.81                  | 2.55                   | 2.62                 | 2.59                   |
|                           | Total Organic Carbon               | mg/L    | -                                          | -              | 2.55                  | 2.12                | 2.03                  | 2.9                   | 2.5                 | 3.4                   | 2.55                   | 2.30                 | 2.31                   |
|                           | Total Phosphorus                   | mg/L    | 0.020 <sup>α</sup>                         | -              | 0.0205                | 0.0036              | 0.0122                | 0.0220                | 0.0243              | 0.0182                | <0.0030                | 0.0035               | 0.0036                 |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -              | 0.0025                | <0.0010             | <0.0010               | <0.0010               | 0.0013              | 0.0012                | <0.0010                | <0.0010              | <0.0010                |
|                           | Bromide (Br)                       | mg/L    | -                                          | -              | <0.10                 | <0.10               | <0.10                 | <0.10                 | <0.10               | <0.10                 | <0.10                  | <0.10                | <0.10                  |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120            | 1.05                  | 0.94                | 1.11                  | 9.45                  | 8.36                | 8.94                  | 9.45                   | 11.6                 | 14.4                   |
|                           | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218            | 0.67                  | 0.73                | 0.65                  | 5.69                  | 5.19                | 5.63                  | 4.96                   | 7.03                 | 7.99                   |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179          | 0.0551                | 0.112               | 0.197                 | 0.868                 | 1.27                | 1.00                  | 0.0116                 | 0.107                | 0.143                  |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -              | <0.00010              | <0.00010            | <0.00010              | <0.00010              | <0.00010            | <0.00010              | <0.00010               | <0.00010             | <0.00010               |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005          | <0.00010              | 0.00012             | <0.00010              | 0.00018               | 0.00025             | 0.00020               | <0.00010               | <0.00010             | <0.00010               |
|                           | Barium (Ba)                        | mg/L    | -                                          | -              | 0.00462               | 0.00530             | 0.00474               | 0.0155                | 0.0171              | 0.0152                | 0.0134                 | 0.0140               | 0.0145                 |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -              | <0.00050              | <0.00050            | <0.00050              | <0.00010              | <0.00010            | <0.00010              | <0.00050               | <0.00050             | <0.00050               |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -              | <0.00050              | <0.00050            | <0.00050              | <0.000050             | <0.000050           | <0.000050             | <0.00050               | <0.00050             | <0.00050               |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -              | <0.010                | <0.010              | <0.010                | <0.010                | <0.010              | <0.010                | <0.010                 | <0.010               | <0.010                 |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008        | <0.000010             | 0.000064            | <0.000010             | 0.0000063             | <0.0000050          | <0.0000050            | <0.000010              | <0.000010            | <0.000010              |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -              | 6.95                  | 7.30                | 4.21                  | 16.4                  | 16.7                | 15.0                  | 24.8                   | 24.7                 | 22.2                   |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089         | <0.00050              | <0.00050            | <0.00050              | 0.00167               | 0.00256             | 0.00171               | <0.00050               | <0.00050             | <0.00050               |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004          | <0.00010              | <0.00010            | <0.00010              | 0.00034               | 0.00056             | 0.00036               | <0.00010               | <0.00010             | <0.00010               |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022         | 0.00056               | 0.00670             | 0.00092               | 0.0019                | 0.0024              | 0.0019                | 0.00085                | 0.00102              | 0.00123                |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326          | <0.030                | 0.102               | 0.181                 | 0.748                 | 1.22                | 0.855                 | <0.030                 | 0.084                | 0.127                  |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001          | <0.000050             | 0.000387            | 0.000260              | 0.000587              | 0.000934            | 0.000661              | <0.000050              | 0.000084             | 0.000130               |
|                           | Lithium (Li)                       | mg/L    | -                                          | -              | <0.0010               | <0.0010             | <0.0010               | 0.0018                | 0.0023              | 0.0018                | <0.0010                | <0.0010              | 0.0010                 |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -              | 4.06                  | 3.66                | 2.43                  | 9.03                  | 9.37                | 8.63                  | 13.9                   | 13.4                 | 12.5                   |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -              | 0.000824              | 0.00299             | 0.00376               | 0.00948               | 0.0160              | 0.0101                | 0.000498               | 0.00133              | 0.00202                |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -              | <0.0000050            | <0.0000050          | <0.0000050            | <0.0000050            | 0.0000051           | <0.0000050            | <0.0000050             | <0.0000050           | <0.0000050             |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -              | 0.000068              | 0.000087            | 0.000060              | 0.000458              | 0.000399            | 0.000434              | 0.000313               | 0.000447             | 0.000544               |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025          | <0.00050              | 0.00338             | <0.00050              | 0.00121               | 0.00180             | 0.00130               | <0.00050               | <0.00050             | <0.00050               |
|                           | Potassium (K)                      | mg/L    | -                                          | -              | 0.53                  | 0.76                | 0.53                  | 1.62                  | 1.69                | 1.63                  | 1.30                   | 1.44                 | 1.61                   |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -              | <0.0010               | <0.0010             | <0.0010               | <0.000050             | <0.000050           | <0.000050             | <0.0010                | <0.0010              | <0.0010                |
|                           | Silicon (Si)                       | mg/L    | -                                          | -              | 0.67                  | 0.66                | 0.73                  | 1.93                  | 2.72                | 2.11                  | 0.88                   | 0.94                 | 1.03                   |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001         | <0.000010             | <0.000010           | <0.000010             | <0.000050             | <0.000050           | <0.000050             | <0.000010              | <0.000010            | <0.000010              |
|                           | Sodium (Na)                        | mg/L    | -                                          | -              | 0.783                 | 1.02                | 0.818                 | 4.94                  | 4.29                | 4.58                  | 4.77                   | 5.77                 | 6.95                   |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -              | 0.00571               | 0.00584             | 0.00465               | 0.0225                | 0.0211              | 0.0207                | 0.0228                 | 0.0259               | 0.0270                 |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008         | <0.00010              | <0.00010            | <0.00010              | 0.000021              | 0.000030            | 0.000021              | <0.00010               | <0.00010             | <0.00010               |
|                           | Tin (Sn)                           | mg/L    | -                                          | -              | <0.00010              | 0.00101             | <0.00010              | <0.00010              | <0.00010            | <0.00010              | <0.00010               | <0.00010             | <0.00010               |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -              | <0.010                | <0.010              | 0.010                 | 0.0518                | 0.0837              | 0.0593                | <0.010                 | <0.010               | <0.010                 |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -              | 0.000441              | 0.000389            | 0.000304              | 0.00584               | 0.00522             | 0.00509               | 0.00673                | 0.00720              | 0.00776                |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006          | <0.0010               | <0.0010             | <0.0010               | 0.00161               | 0.00240             | 0.00176               | <0.0010                | <0.0010              | <0.0010                |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030          | <0.0030               | 0.0320              | 0.0033                | 0.0197                | 0.0032              | <0.0030               | <0.0030                | <0.0030              | <0.0030                |

Indicates parameter concentration above the applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]) and β (British Columbia Water Quality Guideline [BCWQG]). See Table 2.2 for information regar

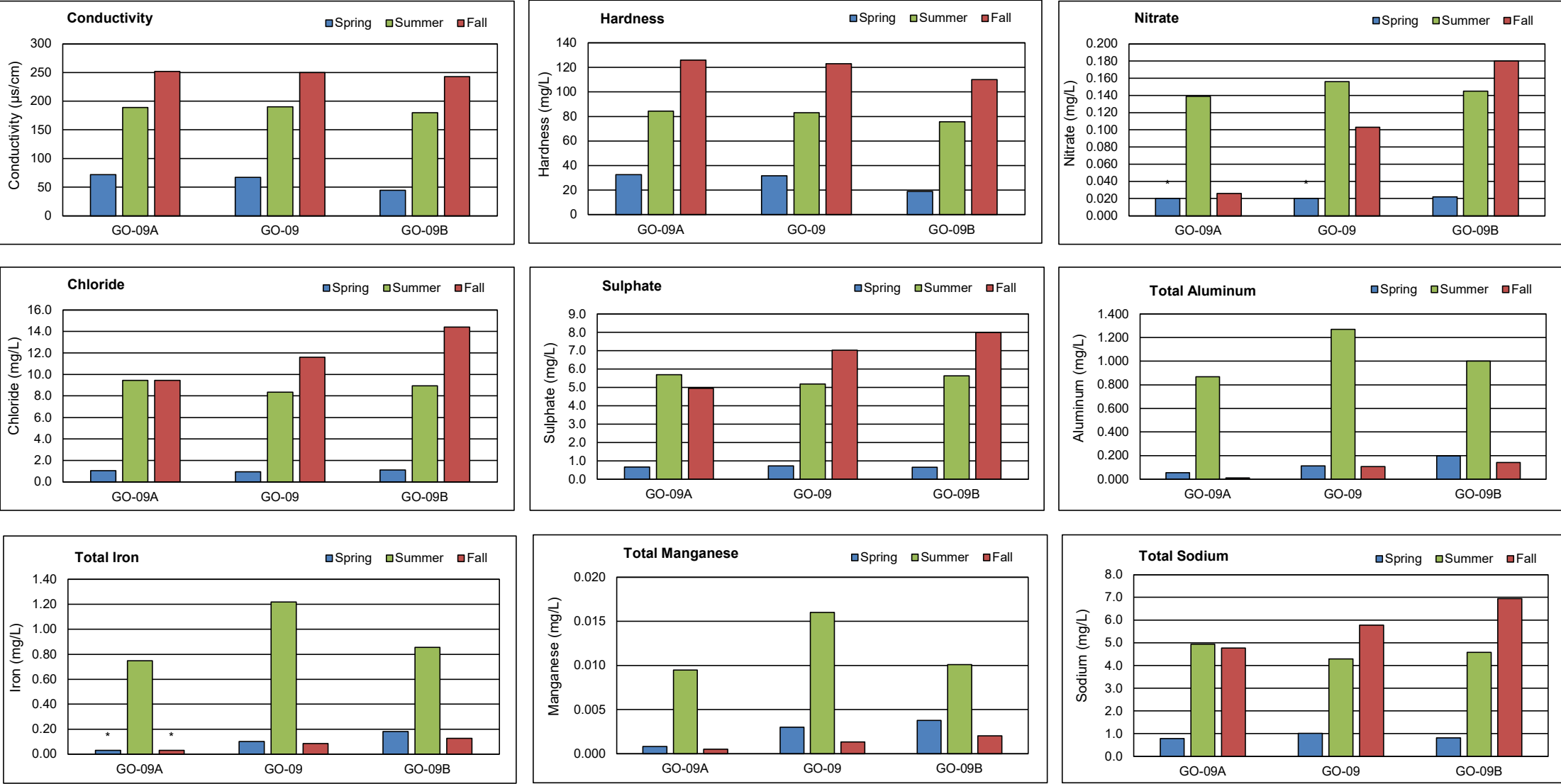


**Figure B.2: Seasonal Variation in Water Chemistry at Mary River GO-09 Reference Stations, Mary River Project CREMP, 2020**

Note: Asterisk (\*) indicates that the parameter concentration was below the laboratory reportable detection limit.

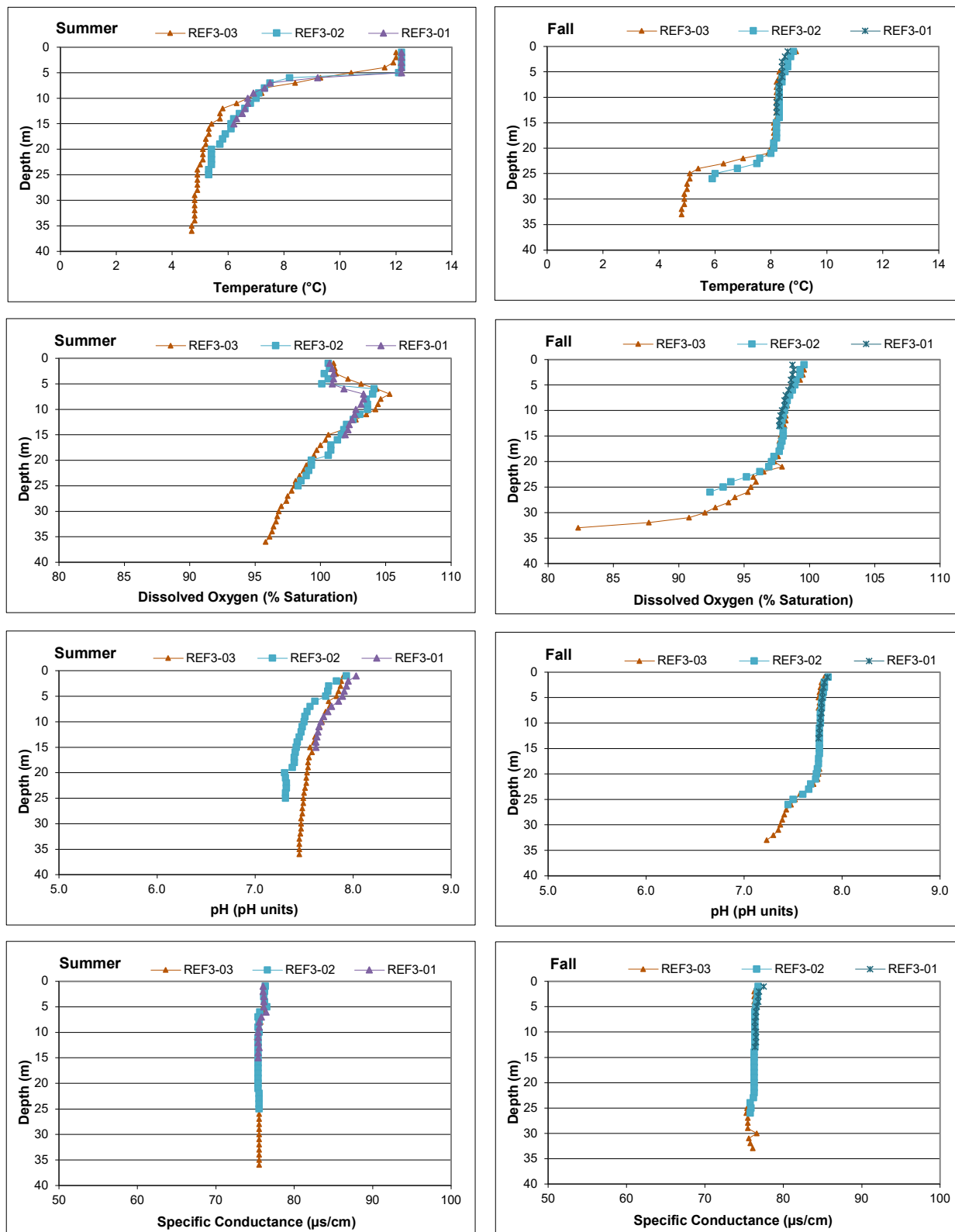


**Figure B.3:** *In Situ* Water Quality with Depth from Surface at Reference Lake 3 during Summer and Fall Sampling Events, Mary River Project CREMP, 2020

25 m, respectively (Appendix Figure B.3). No marked changes in dissolved oxygen concentrations occurred with increased depth at any of the Reference Lake 3 basins, and dissolved oxygen saturation remained high (i.e.,  $\geq 80\%$ ) throughout the entire water column in both the summer and fall profiles (Appendix Figure B.3). The 2020 water quality profiles also showed only minor changes in pH and specific conductance among stations and with depth during each of the summer and fall sampling events (Appendix Figure B.3). Overall, the *in situ* water quality profiles suggested relatively thorough lateral mixing within Reference Lake 3 and despite the development of thermally stratification, no substantial changes in dissolved oxygen, pH, or conductivity occurred with depth through the water column.

The evaluation of water chemistry at Reference Lake 3 indicated that all monitored parameters were below WQG in summer and fall 2020 (Appendix Table B.4). No parameters were observed at concentrations above lentic AEMP benchmarks at Reference Lake 3 (Appendix Table B.4), suggesting that these water quality benchmarks were relevant for comparisons of water quality for the mine-exposed lakes. No substantial differences in water chemistry were observed between the summer and fall at Reference Lake 3 in 2020, which was similar to observations among winter, summer, and fall at local study area lakes during the mine baseline period and in summer and fall at Reference Lake 3 from 2015 to 2019 (KP 2014a; Minnow 2016a, 2017, 2018a, 2019, 20). Temporal comparisons also showed no substantial changes in water quality from 2015 to 2020 at Reference Lake 3 (Appendix Figure C.29).

Water chemistry data collected at Reference Lake 3 showed no consistent differences in parameter concentrations between the surface and the bottom of the water column at each individual station in 2020 (Appendix Figure B.4; Appendix Table B.4). The absence of any appreciable depth-related differences in parameter concentrations at each station was consistent with only minor differences in dissolved oxygen saturation, pH, and/or specific conductance with increased depth from the surface. Because anoxic conditions do not appear to develop in the summer or fall at Reference Lake 3, reducing conditions conducive to metal mobilization from sediment to the overlying water are less likely to occur near the lake bottom, resulting in relatively uniform water chemistry between surface and bottom waters of Reference Lake 3. Accordingly, metal concentrations can naturally be expected to be similar between surface and bottom of local study area lakes provided no substantial gradients in dissolved oxygen saturation, pH, and/or specific conductance occur within the water column.



Table B.4: Water Chemistry at Reference Lake 3, Mary River Project CREMP, 2020

| Parameters                |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |            |            |            |            |            | Fall Sampling Event |             |             |             |             |             |
|---------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|---------------------|-------------|-------------|-------------|-------------|-------------|
|                           |                                    |         |                                            |                             | REF3-01               | REF3-01    | REF3-02    | REF3-02    | REF3-03    | REF3-03    | REF3-01             | REF3-01     | REF3-02     | REF3-02     | REF3-03     | REF3-03     |
|                           |                                    |         |                                            |                             | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom              | surface     | bottom      | surface     | bottom      | surface     |
|                           |                                    |         |                                            |                             | 2-Aug-2020            | 2-Aug-2020 | 2-Aug-2020 | 2-Aug-2020 | 2-Aug-2020 | 2-Aug-2020 | 29-Aug-2020         | 29-Aug-2020 | 29-Aug-2020 | 29-Aug-2020 | 29-Aug-2020 | 29-Aug-2020 |
| Conventional <sup>b</sup> | Conductivity (lab)                 | umho/cm | -                                          | -                           | 78.8                  | 78.8       | 78.5       | 79.0       | 78.4       | 78.9       | 79.0                | 79.6        | 78.4        | 79.2        | 77.7        | 79.3        |
|                           | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.67                  | 7.73       | 7.52       | 7.79       | 7.46       | 7.78       | 7.83                | 7.86        | 7.73        | 7.83        | 7.47        | 7.80        |
|                           | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 34.8                  | 34.2       | 35.7       | 35.4       | 34.2       | 35         | 38.1                | 38.4        | 38.1        | 38.1        | 37.3        | 37.8        |
|                           | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0                | <2.0        | <2.0        | <2.0        | <2.0        | <2.0        |
|                           | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 37                    | 37         | 36         | 55         | 39         | 40         | 50                  | 56          | 44          | 50          | 54          | 50          |
|                           | Turbidity                          | NTU     | -                                          | -                           | 0.15                  | 0.14       | 0.18       | 0.14       | 0.13       | 0.15       | 0.12                | 0.14        | 0.20        | 0.16        | 0.12        | 0.13        |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 43                    | 45         | 52         | 45         | 43         | 47         | 34                  | 35          | 34          | 35          | 33          | 35          |
| Nutrients and Organics    | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010      | <0.010      | <0.010      | 0.031       | 0.014       |
|                           | Nitrate                            | mg/L    | 3                                          | 3                           | <0.020                | <0.020     | <0.020     | <0.020     | <0.020     | <0.020     | <0.020              | <0.020      | <0.020      | <0.020      | <0.020      | <0.020      |
|                           | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050             | <0.0050     | <0.0050     | <0.0050     | <0.0050     | <0.0050     |
|                           | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | 0.16                | 0.16        | 0.17        | <0.15       | 0.15        | 0.15        |
|                           | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.44                  | 3.40       | 3.18       | 3.27       | 3.32       | 3.38       | 3.39                | 3.42        | 3.52        | 3.62        | 3.25        | 3.50        |
|                           | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.72                  | 4.68       | 4.42       | 4.29       | 4.70       | 4.92       | 3.76                | 3.96        | 3.72        | 3.71        | 3.63        | 3.75        |
|                           | Total Phosphorus                   | mg/L    | 0.030 <sup>a</sup>                         | -                           | <0.0030               | <0.0030    | 0.0092     | <0.0030    | <0.0030    | 0.0035     | <0.0030             | <0.0030     | <0.0030     | 0.0034      | <0.0030     | <0.0030     |
| Anions                    | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010             | 0.0012      | <0.0010     | <0.0010     | 0.0011      | <0.0010     |
|                           | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10               | <0.10       | <0.10       | <0.10       | <0.10       | <0.10       |
|                           | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.48                  | 1.35       | 1.34       | 1.36       | 1.34       | 1.34       | 1.36                | 1.38        | 1.37        | 1.37        | 1.38        | 1.37        |
| Anions                    | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 3.62                  | 3.64       | 3.59       | 3.67       | 3.55       | 3.59       | 3.65                | 3.67        | 3.62        | 3.65        | 3.62        | 3.62        |
| Total Metals              | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                       | <0.0030               | 0.0034     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030             | 0.0033      | <0.0030     | <0.0030     | <0.0030     | 0.0037      |
|                           | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010    | <0.00010    | <0.00010    | <0.00010    | <0.00010    |
|                           | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010    | <0.00010    | <0.00010    | <0.00010    | <0.00010    |
|                           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00640               | 0.00653    | 0.00631    | 0.00657    | 0.00600    | 0.00633    | 0.00649             | 0.00941     | 0.00665     | 0.00650     | 0.00630     | 0.00639     |
|                           | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050    | <0.00050    | <0.00050    | <0.00050    | <0.00050    |
|                           | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050    | <0.00050    | <0.00050    | <0.00050    | <0.00050    |
|                           | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010      | <0.010      | <0.010      | <0.010      | <0.010      |
|                           | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                     | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010           | <0.000010   | <0.000010   | <0.000010   | <0.000010   | <0.000010   |
|                           | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.18                  | 7.31       | 6.98       | 7.23       | 7.09       | 7.23       | 7.23                | 7.35        | 7.37        | 7.15        | 7.07        | 7.25        |
|                           | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050    | <0.00050    | <0.00050    | <0.00050    | <0.00050    |
|                           | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010    | <0.00010    | <0.00010    | <0.00010    | <0.00010    |
|                           | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                      | 0.00071               | 0.00073    | 0.00076    | 0.00075    | 0.00070    | 0.00072    | 0.00073             | 0.00079     | 0.00079     | 0.00073     | 0.00074     | 0.00074     |
|                           | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030              | <0.030      | <0.030      | <0.030      | <0.030      | <0.030      |
|                           | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050           | <0.000050   | <0.000050   | <0.000050   | <0.000050   | <0.000050   |
|                           | Lithium (Li)                       | mg/L    | -                                          | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010             | <0.0010     | <0.0010     | <0.0010     | <0.0010     | <0.0010     |
|                           | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.23                  | 4.30       | 4.28       | 4.40       | 4.03       | 4.17       | 4.71                | 4.77        | 4.67        | 4.75        | 4.51        | 4.59        |
|                           | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.000850              | 0.000789   | 0.000852   | 0.000764   | 0.000805   | 0.000740   | 0.000647            | 0.000730    | 0.000731    | 0.000639    | 0.000691    | 0.000650    |
|                           | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050  | <0.0000050  | <0.0000050  | <0.0000050  | <0.0000050  |
|                           | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000137              | 0.000139   | 0.000130   | 0.000127   | 0.000123   | 0.000130   | 0.000151            | 0.000176    | 0.000152    | 0.000155    | 0.000137    | 0.000150    |
|                           | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050    | <0.00050    | <0.00050    | <0.00050    | <0.00050    |
|                           | Potassium (K)                      | mg/L    | -                                          | -                           | 0.86                  | 0.87       | 0.87       | 0.89       | 0.83       | 0.86       | 0.92                | 0.91        | 0.91        | 0.91        | 0.88        | 0.89        |
|                           | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010             | <0.0010     | <0.0010     | <0.0010     | <0.0010     | <0.0010     |
|                           | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.49                  | 0.48       | 0.50       | 0.48       | 0.53       | 0.49       | 0.48                | 0.48        | 0.51        | 0.47        | 0.55        | 0.49        |
|                           | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010           | <0.000010   | <0.000010   | <0.000010   | <0.000010   | <0.000010   |
|                           | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.889                 | 0.902      | 0.886      | 0.917      | 0.862      | 0.885      | 0.968               | 1.00        | 0.963       | 0.972       | 0.939       | 0.942       |
|                           | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00882               | 0.00843    | 0.00811    | 0.00840    | 0.00796    | 0.00859    | 0.00830             | 0.00837     | 0.00826     | 0.00821     | 0.00804     | 0.00820     |
|                           | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010    | <0.00010    | <0.00010    | <0.00010    | <0.00010    |
|                           | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010    | <0.00010    | <0.00010    | <0.00010    | <0.00010    |
|                           | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010      | <0.010      | <0.010      | <0.010      | <0.010      |
|                           | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.000315              | 0.000328   | 0.000299   | 0.000335   | 0.000293   | 0.000328   | 0.000340            | 0.000363    | 0.000319    | 0.000344    | 0.000294    | 0.000327    |
|                           | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010             | <0.0010     | <0.0010     | <0.0010     | <0.0010     | <0.0010     |
|                           | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030             | <0.0030     | <0.0030     | <0.0030     | <0.0030     | <0.0030     |

 Indicates parameter concentration above applicable Water Quality Guideline.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]) and β (British Columbia Water Quality Guideline [BCWQG]). See Table 2.2 for information regarding WQG.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using background water quality data. The values presented are specific to the Camp Lake system.

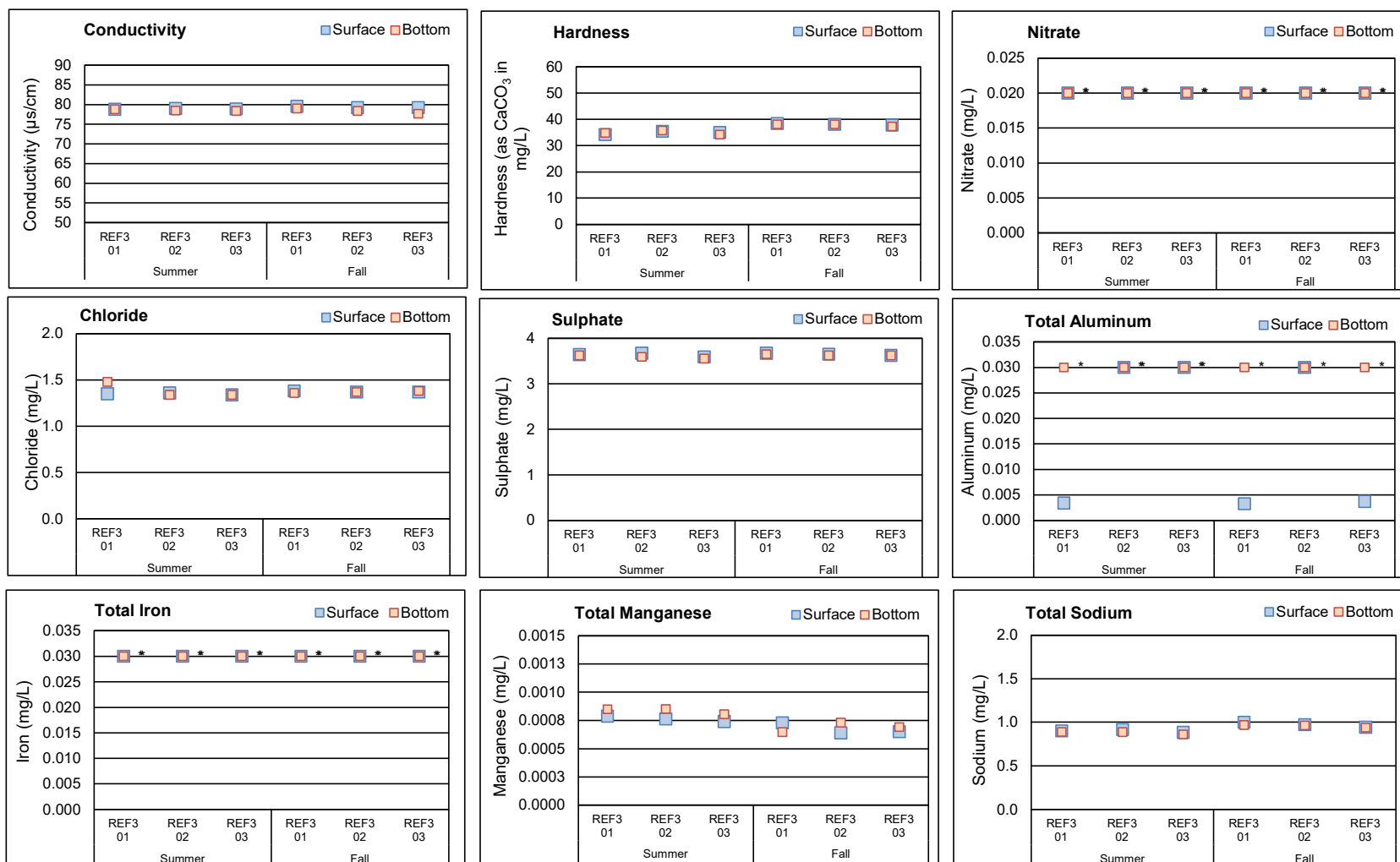


**Figure B.4: Water Chemistry Comparison Between the Surface and the Bottom of the Water Column at Reference Lake 3 Routine Monitoring Stations during Summer and Fall, Mary River Project CREMP, 2020**

Note: An asterisk (\*) indicates that the parameter concentration was below the laboratory reportable detection limit.

## B4 SEDIMENT QUALITY

### B4.1 Creek/Tributary Environments

Deposited sediment at Unnamed Reference Creek (CLT-REF) was visually characterized as predominantly medium-sized sand by Minnow (2018a). In-stream substrate of the reference creek was described as mainly cobble and pebble material (i.e., substrate diameter 6 to 25 cm, and 2 to 6 cm, respectively), with sand constituting only a small amount (i.e., ~7%) of the material observed at the sediment surface (Minnow 2018a). Deposited sediment suitable for chemical characterization (i.e., sand and finer substrate sizes) was present primarily at shoreline/streambank areas, and not in the main channel. Sediment total organic carbon (TOC) content was very low (i.e., <0.1%) at the reference creek suggesting very limited deposition of fine organic materials (Minnow 2018a). Metal concentrations in deposited sediment at the reference creek were well below SQG during sampling conducted in 2017 (Minnow 2018a) and 2020 (Appendix Table D.2), and therefore the Unnamed Reference Creek data were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on chemistry of deposited sediment at the mine-exposed creeks.

### B4.2 River Environments

Deposited sediment at the Mary River (G0-09) upstream reference area was visually characterized as predominantly coarse sand in 2017 (Minnow 2018a). In-stream substrate of the reference creek was composed mainly of boulder and cobble material (i.e., substrate diameter >25 cm, and 6 to 25 cm, respectively), with sand constituting only a minor amount (i.e., ~10%) of the material observed at the sediment surface. Deposited sediment suitable for chemical characterization (i.e., sand and finer substrate sizes) was collected in-stream from quiescent zones immediately downstream of large boulders in 2017 (Minnow 2018a) and 2020. Sediment total organic carbon (TOC) content was very low (i.e., <0.1%) at the G0-09 reference area, suggesting very limited deposition of fine organic materials. Metal concentrations in deposited sediment at the reference creek were shown to be well below SQG in 2017 (Minnow 2018a) and 2020 (Appendix Table D.34), and therefore the G0-09 data were deemed to provide a meaningful benchmark for the evaluation of potential mine-related influences on chemistry of deposited sediment at the Mary River mine-exposed study areas.

### B4.3 Lake Environments (Reference Lake 3)

Sediment sampling was conducted at littoral and profundal (i.e., <12 m and >12 m depths, respectively) areas of Reference Lake 3 from 2015 to 2020 for the analysis of particle





size, total organic carbon (TOC) content, and total metal concentrations (see Figure 2.3). Surficial sediment at Reference Lake 3 littoral and profundal areas was composed of silty to sandy loam material with moderate TOC content. Sediment moisture differed significantly between the Reference Lake 3 littoral and profundal habitats in 2020, with higher moisture content present at littoral stations compared to the profundal stations (Appendix Table F.17). No significant differences in substrate particle size or TOC content occurred between the littoral and profundal stations sampled at the reference lake in 2020 (Appendix Table F.17). A surficial and/or sub-surface layer of oxidized material (likely iron hydroxide or oxy-hydroxides), visible as an orange-brown floc or distinct layer, was occasionally observed in the surficial sediment of Reference Lake 3 (Appendix Tables D.3 and D.4). In addition, sub-surface sediment of Reference Lake 3 occasionally contained blackened/dark colouration, which suggested the occurrence of reducing (i.e., anoxic) sediment conditions (Appendix Tables D.3 and D.4). The physical properties of sediment observed at Reference Lake 3 in 2020 were consistent with those of the 2015 to 2019 studies (see Minnow 2016a, 2017, 2018a, 2019, 2020).

Metal concentrations in sediment at Reference Lake 3 were generally lower at the littoral stations than at the profundal stations, although less than a two-fold difference in concentrations was typically shown for most parameters between the littoral and profundal station depths (Appendix Table B.5; Appendix Figure B.5). The differences in sediment metal concentrations between the littoral and profundal station depths likely reflected a naturally (but not significantly) higher proportion of clay-sized particles at the latter, which is consistent with expected depositional patterns in lakes. Among metals with established SQG, mean concentrations of iron were elevated above SQG at littoral and profundal stations, and mean concentrations of manganese were elevated above SQG at profundal stations of Reference Lake 3 in 2020 (Appendix Table B.5). Therefore, compared to SQG, high concentrations of iron and manganese appear to occur naturally in sediments of Mary River Project local study area lakes. Mean copper and iron concentrations at littoral stations, and mean copper, iron, and manganese concentrations at profundal stations, were above the most stringent (i.e., lowest) AEMP sediment quality benchmarks at Reference Lake 3 (Appendix Table B.5). This suggested that the AEMP sediment benchmarks for these metals were conservative. No substantial changes in concentrations of metals were indicated from 2015 to 2020 at littoral or profundal stations of Reference Lake 3 (Appendix Figure B.5; Figure 3.7).



**Table B.5: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Reference Lake 3 (REF-03) Sediment Stations, Mary River Project CREMP, August 2020**

| Parameter  |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | Most Stringent AEMP Benchmark | Reference Lake 3 Station |                         |                        |                         |                        |                         |                        |                         |                        |                          | Study Area Summary Statistics |                    |                |
|------------|----------------------|-------|-----------------------------------------------|-------------------------------|--------------------------|-------------------------|------------------------|-------------------------|------------------------|-------------------------|------------------------|-------------------------|------------------------|--------------------------|-------------------------------|--------------------|----------------|
|            |                      |       |                                               |                               | REF-03-1<br>(littoral)   | REF-03-6<br>(profundal) | REF-03-2<br>(littoral) | REF-03-7<br>(profundal) | REF-03-3<br>(littoral) | REF-03-8<br>(profundal) | REF-03-4<br>(littoral) | REF-03-9<br>(profundal) | REF-03-5<br>(littoral) | REF-03-10<br>(profundal) | Mean                          | Standard Deviation | Standard Error |
| Non-metals | Sand                 | %     | -                                             | -                             | 40.4                     | 56.6                    | 23.4                   | 13.9                    | 24.7                   | 55.3                    | 34.5                   | 15.2                    | 24.8                   | 16.8                     | 30.6                          | 15.7               | 4.97           |
|            | Silt                 | %     | -                                             | -                             | 53.4                     | 36.9                    | 68.4                   | 71.9                    | 61.9                   | 38.4                    | 59.3                   | 71.8                    | 68.2                   | 68.1                     | 59.8                          | 13.05              | 4.13           |
|            | Clay                 | %     | -                                             | -                             | 6.3                      | 6.5                     | 8.2                    | 14.2                    | 13.4                   | 6.3                     | 6.2                    | 13.0                    | 7.0                    | 15.1                     | 9.6                           | 3.79               | 1.198          |
|            | Moisture             | %     | -                                             | -                             | 90.0                     | 78.3                    | 92.3                   | 86.6                    | 87.9                   | 79.4                    | 80.2                   | 84.9                    | 89.2                   | 84.0                     | 85.3                          | 4.79               | 1.51           |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | -                             | 6.95                     | 2.20                    | 6.54                   | 4.30                    | 3.71                   | 2.36                    | 2.26                   | 4.52                    | 4.54                   | 3.71                     | 4.11                          | 1.66               | 0.525          |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | -                             | 15,400                   | 19,000                  | 18,200                 | 24,700                  | 19,300                 | 20,400                  | 16,200                 | 22,300                  | 15,300                 | 22,600                   | 19,340                        | 3,204              | 1,013          |
|            | Antimony (Sb)        | mg/kg | -                                             | -                             | <0.10                    | <0.10                   | <0.10                  | <0.10                   | <0.10                  | <0.10                   | <0.10                  | <0.10                   | <0.10                  | <0.10                    | <0.10                         | 0                  | 0              |
|            | Arsenic (As)         | mg/kg | 17                                            | 5.9                           | 4.73                     | 3.66                    | 4.36                   | 4.65                    | 3.67                   | 3.76                    | 2.78                   | 4.03                    | 2.10                   | 4.24                     | 3.80                          | 0.82               | 0.261          |
|            | Barium (Ba)          | mg/kg | -                                             | -                             | 139                      | 98.4                    | 134                    | 143                     | 99.7                   | 108                     | 88.4                   | 129                     | 124                    | 132                      | 120                           | 19.3               | 6.10           |
|            | Beryllium (Be)       | mg/kg | -                                             | -                             | 0.59                     | 0.68                    | 0.74                   | 0.93                    | 0.69                   | 0.77                    | 0.65                   | 0.80                    | 0.56                   | 0.84                     | 0.73                          | 0.11               | 0.036          |
|            | Bismuth (Bi)         | mg/kg | -                                             | -                             | <0.20                    | <0.20                   | <0.20                  | <0.20                   | <0.20                  | <0.20                   | <0.20                  | <0.20                   | <0.20                  | <0.20                    | <0.20                         | 0                  | 0              |
|            | Boron (B)            | mg/kg | -                                             | -                             | 11.6                     | 11.9                    | 13.1                   | 16.8                    | 13.2                   | 14.5                    | 11.7                   | 15.1                    | 11.5                   | 15.0                     | 13.4                          | 1.84               | 0.580          |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 1.5                           | 0.246                    | 0.128                   | 0.184                  | 0.175                   | 0.120                  | 0.144                   | 0.163                  | 0.142                   | 0.150                  | 0.150                    | 0.160                         | 0.0359             | 0.0114         |
|            | Calcium (Ca)         | mg/kg | -                                             | -                             | 6,080                    | 4,410                   | 7,440                  | 5,480                   | 4,820                  | 4,830                   | 4,190                  | 5,180                   | 5,510                  | 5,150                    | 5,309                         | 930                | 294            |
|            | Chromium (Cr)        | mg/kg | 90                                            | 79                            | 54.9                     | 57.1                    | 57.4                   | 73.0                    | 59.4                   | 59.3                    | 48.6                   | 68.5                    | 51.3                   | 67.3                     | 59.7                          | 7.75               | 2.45           |
|            | Cobalt (Co)          | mg/kg | -                                             | -                             | 10.8                     | 13.2                    | 9.86                   | 17.2                    | 12.8                   | 14.1                    | 11.8                   | 15.6                    | 8.59                   | 15.8                     | 13.0                          | 2.77               | 0.88           |
|            | Copper (Cu)          | mg/kg | 197                                           | 50                            | 80.0                     | 68.8                    | 89.7                   | 97.6                    | 72.2                   | 77.5                    | 59.8                   | 86.1                    | 55.3                   | 89.2                     | 77.6                          | 13.7               | 4.32           |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 34,400                        | 83,200                   | 39,600                  | 68,900                 | 51,100                  | 41,400                 | 42,100                  | 38,000                 | 45,700                  | 21,500                 | 46,900                   | 47,840                        | 17,136             | 5,419          |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 35                            | 13.7                     | 14.2                    | 14.3                   | 19.1                    | 14.8                   | 15.8                    | 12.9                   | 17.2                    | 13.1                   | 17.1                     | 15.2                          | 2.03               | 0.64           |
|            | Lithium (Li)         | mg/kg | -                                             | -                             | 23.2                     | 29.3                    | 26.3                   | 38.8                    | 29.6                   | 30.6                    | 26.8                   | 34.4                    | 24.1                   | 35.5                     | 29.9                          | 5.09               | 1.61           |
|            | Magnesium (Mg)       | mg/kg | -                                             | -                             | 11,600                   | 12,500                  | 11,800                 | 16,000                  | 12,500                 | 13,000                  | 10,400                 | 14,800                  | 10,900                 | 14,600                   | 12,810                        | 1,811              | 573            |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 657                           | 578                      | 909                     | 413                    | 1,250                   | 790                    | 1,010                   | 866                    | 1,820                   | 246                    | 1,160                    | 904                           | 451                | 143            |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.17                          | 0.0730                   | 0.0391                  | 0.0594                 | 0.0689                  | 0.0396                 | 0.0497                  | 0.0269                 | 0.0806                  | 0.0511                 | 0.0530                   | 0.0541                        | 0.0167             | 0.0053         |
|            | Molybdenum (Mo)      | mg/kg | -                                             | -                             | 6.77                     | 2.74                    | 8.95                   | 2.86                    | 2.87                   | 2.40                    | 2.74                   | 2.19                    | 0.87                   | 2.42                     | 3.48                          | 2.43               | 0.770          |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 66                            | 44.5                     | 39.5                    | 41.7                   | 50.9                    | 40.4                   | 41.6                    | 38.5                   | 47.3                    | 35.1                   | 45.7                     | 42.5                          | 4.64               | 1.47           |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,278                         | 1,700                    | 888                     | 1,470                  | 1,000                   | 963                    | 959                     | 810                    | 933                     | 892                    | 999                      | 1,061                         | 287                | 91             |
|            | Potassium (K)        | mg/kg | -                                             | -                             | 3,560                    | 4,660                   | 4,280                  | 6,030                   | 4,760                  | 4,940                   | 4,040                  | 5,590                   | 3,860                  | 5,470                    | 4,719                         | 805                | 255            |
|            | Selenium (Se)        | mg/kg | -                                             | -                             | 1.02                     | 0.40                    | 1.09                   | 0.68                    | 0.58                   | 0.55                    | 0.42                   | 0.89                    | 0.53                   | 0.55                     | 0.67                          | 0.24               | 0.077          |
|            | Silver (Ag)          | mg/kg | -                                             | -                             | 0.17                     | 0.12                    | 0.21                   | 0.26                    | 0.12                   | 0.18                    | <0.10                  | 0.25                    | 0.11                   | 0.20                     | 0.17                          | 0.058              | 0.018          |
|            | Sodium (Na)          | mg/kg | -                                             | -                             | 283                      | 299                     | 315                    | 413                     | 332                    | 347                     | 259                    | 421                     | 332                    | 366                      | 337                           | 52                 | 17             |
|            | Strontium (Sr)       | mg/kg | -                                             | -                             | 11.7                     | 10.5                    | 14.3                   | 13.8                    | 11.3                   | 11.8                    | 9.64                   | 12.9                    | 11.0                   | 12.6                     | 12.0                          | 1.46               | 0.461          |
|            | Sulphur (S)          | mg/kg | -                                             | -                             | 1,700                    | <1,000                  | 1,900                  | 1,300                   | 1,300                  | <1,000                  | <1,000                 | 1,400                   | 1,100                  | <1,000                   | 1,270                         | 320                | 101            |
|            | Thallium (Tl)        | mg/kg | -                                             | -                             | 0.373                    | 0.470                   | 0.402                  | 0.714                   | 0.437                  | 0.535                   | 0.355                  | 0.637                   | 0.330                  | 0.614                    | 0.487                         | 0.132              | 0.0418         |
|            | Tin (Sn)             | mg/kg | -                                             | -                             | <2.0                     | <2.0                    | <2.0                   | <2.0                    | <2.0                   | <2.0                    | <2.0                   | <2.0                    | <2.0                   | <2.0                     | <2.0                          | 0                  | 0              |
|            | Titanium (Ti)        | mg/kg | -                                             | -                             | 936                      | 1,070                   | 866                    | 1,190                   | 1,030                  | 1,100                   | 1,050                  | 1,170                   | 1,150                  | 1,150                    | 1,071                         | 105                | 33             |
|            | Uranium (U)          | mg/kg | -                                             | -                             | 14.3                     | 15.5                    | 12.5                   | 24.2                    | 10.3                   | 19.5                    | 9.85                   | 16.7                    | 8.13                   | 22.8                     | 15.4                          | 5.48               | 1.73           |
|            | Vanadium (V)         | mg/kg | -                                             | -                             | 52.4                     | 57.7                    | 61.7                   | 70.2                    | 57.2                   | 60.0                    | 51.3                   | 63.4                    | 47.9                   | 65.7                     | 58.8                          | 6.90               | 2.18           |
|            | Zinc (Zn)            | mg/kg | 315                                           | 123                           | 71.3                     | 73.7                    | 85.7                   | 96.4                    | 74.8                   | 79.3                    | 67.9                   | 82.9                    | 65.8                   | 86.7                     | 78.5                          | 9.56               | 3.02           |
|            | Zirconium (Zr)       | mg/kg | -                                             | -                             | 4.4                      | 3.9                     | 4.9                    | 4.2                     | 3.3                    | 3.5                     | 3.9                    | 3.8                     | 6.0                    | 4.3                      | 4.2                           | 0.78               | 0.25           |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life, probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Objective [PSQO], severe effect level (SEL); OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level (PEL; BCMOE 2015)).

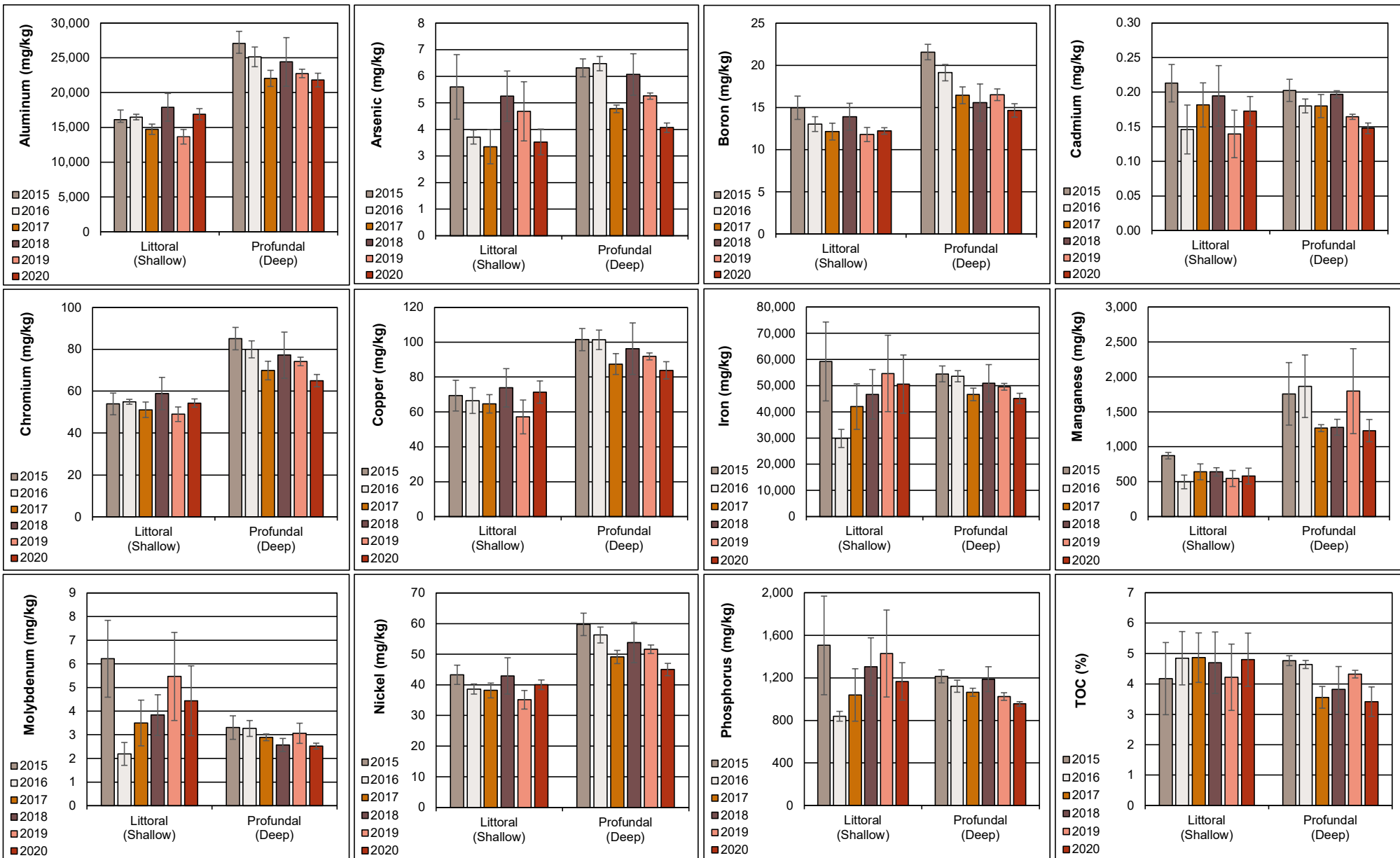


**Figure B.5: Sediment Metal Concentrations (mean  $\pm$  SE) at Littoral (<12m depth) and Profundal (>12m depth) Monitoring Stations of Reference Lake 3 (REF03), Mary River Project CREMP, 2015 to 2020**

## B5 PHYTOPLANKTON (CHLOROPHYLL-A)

### B5.1 Lotic Environments

Chlorophyll-a concentrations, which were used as a surrogate for phytoplankton abundance, ranged from 0.24 to 0.93 µg/L at the reference creek and river stations among spring, summer, and fall sampling events in 2020 (Appendix Table B.6). Therefore, lotic reference station chlorophyll-a concentrations were consistently well below the AEMP benchmark of 3.7 µg/L, and reflected low (i.e., oligotrophic) phytoplankton productivity according to Dodds et al (1998) trophic status classification for stream environments. This trophic status classification was generally consistent with an ultra-oligotrophic to meso-eutrophic CWQG (CCME 2020) categorization for the stream and river reference stations based on mean aqueous total phosphorus concentrations generally ranging between 3 and 24 µg/L during each respective spring, summer, and fall sampling event in 2020 (Appendix Tables B.2 and B.3). Chlorophyll-a concentrations were significantly lower in the spring but highest in the summer at the reference creeks and at the Mary River G0-09 series reference stations, in 2020 (Appendix Tables B.6 and B.7).

Like-season chlorophyll-a concentrations from 2015 to 2020 showed no consistent significant differences among years over the spring, summer, and fall sampling events at either the reference creek or the Mary River reference area stations (Appendix Figure B.6). The variability in response shown among seasons and years at the lotic reference areas indicated that significant differences in chlorophyll-a concentrations occur naturally among years and seasons in watercourses within the Mary River Project mine local study area.

### B5.2 Lentic Environments (Reference Lake 3)

Chlorophyll-a concentrations at Reference Lake 3 showed no consistent differences between the surface and the bottom of the water column at each individual station during both the summer and fall sampling events in 2020 (Appendix Figure B.7). Reference Lake 3 chlorophyll-a concentrations averaged 0.69 µg/L in summer and fall 2020, and were consistently well below the AEMP benchmark of 3.7 µg/L (Appendix Table E.3; Appendix Figure B.7). Similar to the lotic reference stations, mean chlorophyll-a concentrations observed at Reference Lake 3 in 2020 indicated low (i.e., oligotrophic) phytoplankton productivity based on the lake trophic status classification presented in Wetzel (2001). This trophic status classification was generally consistent with an ultra-oligotrophic CWQG (CCME 2020) categorization for Reference Lake 3 based on mean aqueous total phosphorus concentrations below 4 µg/L during the summer and fall sampling events in 2020 (Appendix Table B.4). Chlorophyll-a concentrations did not differ significantly



**Table B.6: Phytoplankton Monitoring Data Collected at Lotic Reference Stations, Mary River Project CREMP, 2020**

|                        |                    | Reference Creek Stations |           |           |           | Mary River Reference Stations |           |           |
|------------------------|--------------------|--------------------------|-----------|-----------|-----------|-------------------------------|-----------|-----------|
|                        |                    | CLT-REF3                 | CLT-REF4  | MRY-REF2  | MRY-REF3  | G0-09-A                       | G0-09     | G0-09-B   |
| Sample Collection Date | Spring             | 4-Jul-20                 | 4-Jul-20  | 4-Jul-20  | 4-Jul-20  | 4-Jul-20                      | 4-Jul-20  | 4-Jul-20  |
|                        | Summer             | 3-Aug-20                 | 3-Aug-20  | 3-Aug-20  | 3-Aug-20  | 3-Aug-20                      | 2-Aug-20  | 2-Aug-20  |
|                        | Fall               | 29-Aug-20                | 29-Aug-20 | 29-Aug-20 | 29-Aug-20 | 28-Aug-20                     | 28-Aug-20 | 28-Aug-20 |
| Chlorophyll-a (µg/L)   | Spring             | 0.35                     | 0.31      | 0.24      | 0.34      | 0.24                          | 0.25      | 0.27      |
|                        | Summer             | 0.62                     | 0.90      | 0.92      | 0.52      | 0.66                          | 0.71      | 0.93      |
|                        | Fall               | 0.74                     | 0.31      | 0.34      | 0.45      | 0.33                          | 0.43      | 0.34      |
|                        | Average            | 0.57                     | 0.51      | 0.50      | 0.44      | 0.41                          | 0.46      | 0.51      |
|                        | Standard Deviation | 0.20                     | 0.34      | 0.37      | 0.09      | 0.22                          | 0.23      | 0.36      |
|                        | Standard Error     | 0.12                     | 0.20      | 0.21      | 0.05      | 0.13                          | 0.13      | 0.21      |
| Phaeophytin-a (µg/L)   | Spring             | 0.40                     | <0.10     | 0.37      | 0.45      | 0.35                          | 0.66      | 0.43      |
|                        | Summer             | 1.17                     | 1.50      | 1.60      | 1.36      | 1.34                          | 1.45      | 1.70      |
|                        | Fall               | 0.78                     | 0.46      | 0.57      | 0.58      | 0.85                          | 0.84      | 0.99      |
|                        | Average            | 0.78                     | 0.69      | 0.85      | 0.80      | 0.85                          | 0.98      | 1.04      |
|                        | Standard Deviation | 0.39                     | 0.73      | 0.66      | 0.49      | 0.50                          | 0.41      | 0.64      |
|                        | Standard Error     | 0.22                     | 0.42      | 0.38      | 0.28      | 0.29                          | 0.24      | 0.37      |

**Table B.7: Statistical Comparisons of Chlorophyll-a Concentrations among Winter, Spring, Summer, and/or Fall Sampling Events at Reference Lotic and Lentic Study Areas, Mary River Project CREMP, 2020**

| Study Lake                          | Overall 3-group Comparison          |         |                               | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |          |                                         |         |
|-------------------------------------|-------------------------------------|---------|-------------------------------|-----------------------------------------------------|----------|-----------------------------------------|---------|
|                                     | Significant Difference Among Areas? | p-value | Statistical Test <sup>b</sup> | (I) Area                                            | (J) Area | Significant Difference Between 2 Areas? | p-value |
| Stream Reference Stations           | YES                                 | 0.036   | K-W                           | Spring                                              | Summer   | YES                                     | 0.011   |
|                                     |                                     |         |                               | Spring                                              | Fall     | NO                                      | 0.325   |
|                                     |                                     |         |                               | Summer                                              | Fall     | NO                                      | 0.115   |
| Mary River GO-09 Reference Stations | YES                                 | 0.027   | K-W                           | Spring                                              | Summer   | YES                                     | 0.007   |
|                                     |                                     |         |                               | Spring                                              | Fall     | NO                                      | 0.180   |
|                                     |                                     |         |                               | Summer                                              | Fall     | NO                                      | 0.180   |
| Reference Lake 3                    | -                                   | -       | -                             | Winter                                              | Summer   | not applicable                          | -       |
|                                     | -                                   | -       | -                             | Winter                                              | Fall     | not applicable                          | -       |
|                                     | YES                                 | 0.022   | t-equal                       | Summer                                              | Fall     | YES                                     | 0.022   |

<sup>a</sup> *Post hoc* analysis of 1-way ANOVA among all areas protected for multiple comparisons.

<sup>b</sup> Statistical tests include Kruskal Wallis H-test (K-W) and t-test with equal variances.

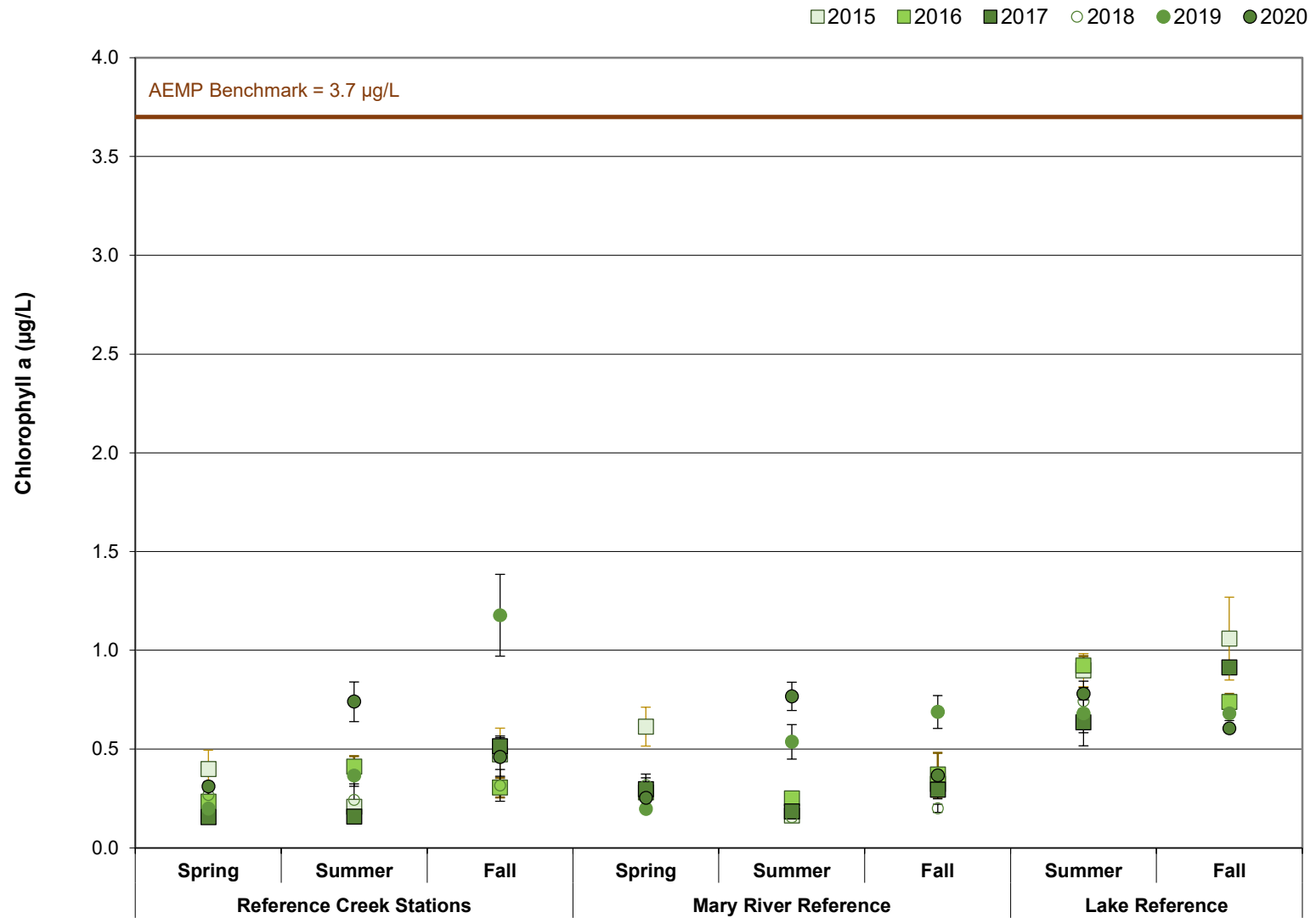


**Figure B.6: Chlorophyll-a Concentration Seasonal Comparison from 2015 to 2020 at Creek, River, and Lake Reference Phytoplankton Monitoring Stations, Mary River Project CREMP**



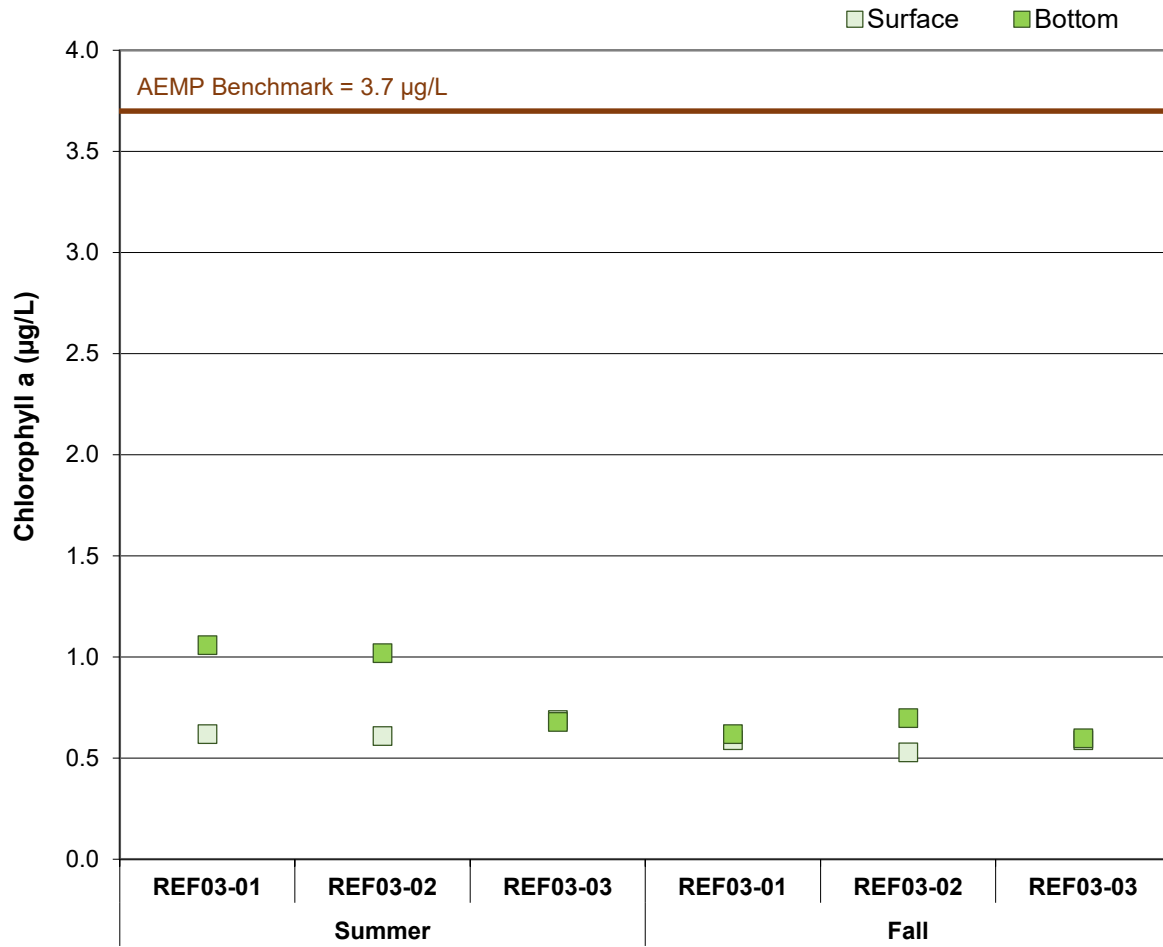


**Figure B.7:** Chlorophyll-a Concentrations at the Surface and Bottom of the Water Column at Reference Lake 3 Phytoplankton Monitoring Stations during Summer and Fall Sampling Events, Mary River Project CREMP, 2020

between the summer and fall at Reference Lake 3 in 2020 (Appendix Table B.7), which was similar to the 2015, but differed from the 2016 (significantly higher chlorophyll-a concentrations in summer compared to fall) and the 2017 and 2018 studies (significantly lower chlorophyll-a concentrations in summer compared to fall). Therefore, although chlorophyll-a concentrations were generally comparable from 2015 to 2020 for like-seasons at Reference Lake 3, the relative seasonal changes in chlorophyll-a concentrations among years suggested naturally variable temporal patterns in phytoplankton abundance can be expected at Mary River Project mine local study area lakes.



## B6 BENTHIC INVERTEBRATE COMMUNITY

### B6.1 Creek/Tributary Environments

The original Mary River Project CREMP design had not included/identified a reference creek from which to evaluate potential mine-related effects on benthic invertebrate communities of creek/tributary environments, instead relying solely on a before-after approach to identify potential mine influences on benthic invertebrates over time (see NSC 2014). Stemming from recommendations from the 2015 CREMP (Minnow 2016b), a reference creek was incorporated into the 2016 to 2020 CREMP benthic invertebrate community studies to provide a stronger basis for evaluating potential within-year mine-related effects to biota residing in mine-exposed tributaries of Camp and Sheardown lakes. The benthic invertebrate community (benthic) study area selected for the CREMP was located within at the same unnamed tributary to Angajurjualuk Lake that is used for reference water quality sampling (Stations CLT-REF4 and MRY-REF2; Table 2.5; Figure 2.4). Criteria used for the selection of this creek as a reference area for the CREMP, which is herein referred to as Unnamed Reference Creek, included a watercourse exhibiting similar habitat characteristics (e.g., width, water velocity, substrate size) as the mine-exposed tributaries that is not/has not been influenced by mining or adverse anthropogenic disturbances. The acceptance of Unnamed Reference Creek as a reference area for the evaluation of mine-related influences on tributary water chemistry under the original CREMP (KP 2014a) was also considered an important criterion in the selection of this watercourse as a suitable reference area for the benthic invertebrate community survey.

Benthic invertebrate density at Unnamed Reference Creek ranged from 258 to 1,032 individuals/m<sup>2</sup> in the 2020 study (mean of 713 individuals/m<sup>2</sup>), which is considered moderate for Arctic streams (Craig and McCart 1975). Unnamed Reference Creek showed relatively high richness and Simpson's Evenness in 2020, which was unlike the low production that can naturally be expected in Arctic streams as the result of constraints associated with low nutrients and seasonal temperatures, as well as food limitation (Huryn and Wallace 2000). The dominant taxonomic group observed at Unnamed Reference Creek benthic stations in 2020 was Chironomidae (non-biting midges), collectively accounting for approximately 86% of the community (Appendix Table B.8). Collector-gatherers were the dominant benthic invertebrate functional feeding group (FFG) present at Unnamed Reference Creek (Appendix Table B.8), suggesting greatest reliance upon deposited fine particulate organic matter as a food source for benthic invertebrates. Shredders constituted a low proportion of the Unnamed Reference Creek benthic invertebrate community (Appendix Table B.8), suggesting that live and/or decomposing leaf material was a less important food source. In terms of benthic invertebrate habit preference group (HPG), sprawlers were the dominant



**Table B.8: Benthic Invertebrate Community Summary Statistics for Unnamed Reference Creek and Mary River (GO-09) Reference Areas, Mary River Project CREMP, August 2020**

| Metric                                                  | Area                       | Sample Size | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
|---------------------------------------------------------|----------------------------|-------------|------|--------------------|----------------|---------|---------|
| <b>Density</b><br>(no. organisms / m <sup>2</sup> )     | Unnamed Reference Creek    | 5           | 713  | 296                | 133            | 258     | 1,032   |
|                                                         | Mary River GO-09 Reference | 5           | 886  | 831                | 372            | 315     | 2,208   |
| <b>Richness</b><br>(Number of Taxa)                     | Unnamed Reference Creek    | 5           | 16   | 4.4                | 2.0            | 9.0     | 20.0    |
|                                                         | Mary River GO-09 Reference | 5           | 15   | 2.0                | 0.9            | 12.0    | 17.0    |
| <b>Simpson's Evenness</b>                               | Unnamed Reference Creek    | 5           | 0.84 | 0.04               | 0.02           | 0.77    | 0.88    |
|                                                         | Mary River GO-09 Reference | 5           | 0.83 | 0.15               | 0.07           | 0.56    | 0.92    |
| <b>Nemata</b><br>(% of community)                       | Unnamed Reference Creek    | 5           | 0.7  | 1.3                | 0.6            | 0.0     | 3.0     |
|                                                         | Mary River GO-09 Reference | 5           | 0.5  | 0.6                | 0.3            | 0.0     | 1.2     |
| <b>Hydracarina</b><br>(% of community)                  | Unnamed Reference Creek    | 5           | 4.5  | 3.7                | 1.7            | 2.1     | 11.1    |
|                                                         | Mary River GO-09 Reference | 5           | 1.1  | 1.3                | 0.6            | 0.0     | 3.2     |
| <b>Chironomidae</b><br>(% of community)                 | Unnamed Reference Creek    | 5           | 48.3 | 12.9               | 5.8            | 36.7    | 67.3    |
|                                                         | Mary River GO-09 Reference | 5           | 89.6 | 5.1                | 2.3            | 83.2    | 96.2    |
| <b>Metal Sensitive Chironomidae</b><br>(% of community) | Unnamed Reference Creek    | 5           | 0.8  | 1.2                | 0.6            | 0.0     | 3.0     |
|                                                         | Mary River GO-09 Reference | 5           | 32.0 | 23.7               | 10.6           | 10.8    | 68.7    |
| <b>Tipulidae</b><br>(% of community)                    | Unnamed Reference Creek    | 5           | 1.5  | 2.3                | 1.0            | 0.0     | 5.6     |
|                                                         | Mary River GO-09 Reference | 5           | 1.2  | 0.5                | 0.2            | 0.9     | 2.0     |
| <b>Collector-Gatherer FFG</b><br>(% of community)       | Unnamed Reference Creek    | 5           | 80.7 | 8.8                | 3.9            | 70.0    | 91.1    |
|                                                         | Mary River GO-09 Reference | 5           | 80.2 | 4.1                | 1.8            | 74.9    | 85.5    |
| <b>Filterer FFG</b><br>(% of community)                 | Unnamed Reference Creek    | 5           | 9.9  | 8.9                | 4.0            | 0.0     | 21.5    |
|                                                         | Mary River GO-09 Reference | 5           | 2.0  | 1.8                | 0.8            | 0.0     | 4.9     |
| <b>Shredder FFG</b><br>(% of community)                 | Unnamed Reference Creek    | 5           | 2.8  | 2.7                | 1.2            | 0.0     | 7.0     |
|                                                         | Mary River GO-09 Reference | 5           | 11.3 | 7.1                | 3.2            | 4.7     | 20.1    |
| <b>Clinger HPG</b><br>(% of community)                  | Unnamed Reference Creek    | 5           | 15.8 | 7.7                | 3.5            | 7.8     | 27.0    |
|                                                         | Mary River GO-09 Reference | 5           | 15.0 | 5.8                | 2.6            | 5.9     | 21.3    |
| <b>Sprawler HPG</b><br>(% of community)                 | Unnamed Reference Creek    | 5           | 79.4 | 6.6                | 3.0            | 70.0    | 87.2    |
|                                                         | Mary River GO-09 Reference | 5           | 79.0 | 5.9                | 2.6            | 69.8    | 85.2    |
| <b>Burrower HPG</b><br>(% of community)                 | Unnamed Reference Creek    | 5           | 4.8  | 3.3                | 1.5            | 1.4     | 8.3     |
|                                                         | Mary River GO-09 Reference | 5           | 6.0  | 10.2               | 4.6            | 1.1     | 24.3    |

group at Unnamed Reference Creek (Appendix Table B.8) suggesting that most invertebrates were associated with substrate surfaces and were not deeply embedded in the substrate (i.e., non-burrowers).

## **B6.2 River Environments**

The area of Mary River located upstream of the mine lease property has been considered representative of reference conditions for the mine-exposed stations/study areas situated farther downstream on the Mary River under the CREMP (Baffinland 2015; KP 2014a,b, 2015; NSC 2014). As in previous CREMP studies, the G0-09 area of Mary River (including water quality stations G0-09A, G0-09, and G0-09B) was used as the benthic reference area for mine-exposed areas of Mary River as part of the 2020 CREMP (see Table 2.5; Figure 2.4).

Benthic invertebrate density at the Mary River reference area in the 2020 study ranged from 315 to 2,208 individuals/m<sup>2</sup>, which is considered moderate for Arctic lotic systems (Craig and McCart 1975). Moderate richness and Simpson's Evenness also characterized the benthic invertebrate community of the Mary River reference area, and reflected naturally low Arctic stream environment productivity as a result of low ambient temperatures and nutrient levels (Huryn and Wallace 2000). Midges of the family Chironomidae were the dominant taxonomic group observed at the Mary River reference area, with the relative abundance of this group ranging from 83% to nearly 96% of individuals (mean of 97.2%) and chironomid taxa considered metal-sensitive constituting 11% to 69% of the community (Appendix Table B.8). Similar to the reference creek, collector-gatherers were the dominant FFG present at the Mary River reference area (Appendix Table B.8), suggesting that fine particulate organic matter was the predominant food source for benthic invertebrates at this area. Sprawlers composed the dominant HPG at the Mary River reference area (Appendix Table B.8), which suggested that most benthic invertebrates were associated with the surface of rocky substrates.

Comparison of the Mary River reference area benthic invertebrate communities among baseline (2006, 2007) and mine-operational (2015 to 2020) studies for key metrics indicated no consistent significant differences in density, richness, and relative abundance of metal-sensitive chironomids or the collector-gatherer FFG between the baseline and mine-operational periods (Appendix Figure F.14; Appendix Table F.47). Simpson's Evenness and collector-gatherer FFG relative abundance has routinely been significantly higher and lower, respectively during years of mine operation (2015 to 2018, 2020) compared to baseline (Appendix Figure F.14; Appendix Table F.47). However, the direction of these differences was not consistent with an adverse change but rather suggested more even distribution of invertebrate groups and FFG for the mine-operational period (Appendix Figure F.14).



The changes in benthic invertebrate community metrics between the mine operational and baseline studies at the Mary River reference area were thus attributable to natural variability in community traits among years and/or to artifacts associated with CREMP sampling among studies.

### **B6.3 Lentic Environments (Reference Lake 3)**

The benthic invertebrate community of Reference Lake 3 differed dramatically between littoral (<12 m depth) and profundal (>12 m depth) stations in 2020. As in previous monitoring conducted from 2015 to 2019, significantly higher benthic invertebrate density and richness was observed at littoral stations compared to profundal stations in 2020, both at Critical Effect Sizes outside of  $\pm 2$  SD (Appendix Table B.9). In addition, differences in benthic invertebrate community structure occurred between sampling depths as indicated by significantly higher and lower relative abundance of Ostracoda (seed shrimp) and Chironomidae (non-biting midges), respectively, at littoral stations compared to profundal stations (Appendix Table B.9). No significant differences in the relative abundance of FFG or HPG were indicated between littoral and profundal habitats of Reference Lake 3 in 2020 with the exception of a higher relative abundance of the burrower HPG at littoral stations (Appendix Table B.9). The difference in benthic invertebrate community metrics and assemblage features between the littoral and profundal stations observed at Reference Lake 3 from 2015 to 2020 validated proposed changes to the CREMP benthic invertebrate community survey by Minnow (2016b). Specifically, benthic invertebrate community surveys can focus only on littoral habitat to reflect the fact that natural habitat factors that affect community assemblage at profundal areas limit the ability to interpret potential mine-related biological effects at profundal depths of the local study area lakes.

Littoral and profundal habitat benthic invertebrate communities at Reference Lake 3 in 2020 showed density, richness, Simpson's Evenness, and relative abundance of dominant taxonomic groups and FFGs all within the range of those observed from 2015 to 2019 (Appendix Figures F.5 and F.6). This suggested that the benthic invertebrate community at littoral and profundal habitat of Reference Lake 3 showed relatively minor changes from 2015 to 2020.



**Table B.9: Benthic Invertebrate Community Statistical Comparison Results between Littoral and Profundal Stations at Reference Lake 3, Mary River Project CREMP, August 2020**

| Metric                                | Statistical Test Results |                     |                                       |         |                                                  | Summary Statistics |                |                    |                |         |        |         |
|---------------------------------------|--------------------------|---------------------|---------------------------------------|---------|--------------------------------------------------|--------------------|----------------|--------------------|----------------|---------|--------|---------|
|                                       | Statistical Test         | Data Transformation | Significant Difference Between Areas? | p-value | Magnitude of Difference <sup>a</sup> (No. of SD) | Habitat            | Mean ( n = 5 ) | Standard Deviation | Standard Error | Minimum | Median | Maximum |
| Density (Individuals/m <sup>2</sup> ) | t-equal                  | log10               | YES                                   | < 0.001 | -2.5                                             | Lake Littoral      | 1,571          | 430                | 193            | 1,190   | 1,474  | 2,310   |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 479            | 142                | 63             | 336     | 491    | 681     |
| Richness (Number of Taxa)             | t-equal                  | log10               | YES                                   | < 0.001 | -3.0                                             | Lake Littoral      | 14.6           | 2.5                | 1.1            | 13.0    | 14.0   | 19.0    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 7.0            | 1.9                | 0.8            | 5.0     | 8.0    | 9.0     |
| Simpson's Evenness (E )               | t-equal                  | none                | NO                                    | 0.177   | -0.7                                             | Lake Littoral      | 0.810          | 0.110              | 0.049          | 0.630   | 0.847  | 0.923   |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 0.731          | 0.045              | 0.020          | 0.689   | 0.721  | 0.795   |
| Shannon Diversity                     | t-equal                  | log10               | YES                                   | 0.004   | -1.7                                             | Lake Littoral      | 2.710          | 0.526              | 0.235          | 2.080   | 2.730  | 3.510   |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 1.800          | 0.196              | 0.088          | 1.580   | 1.720  | 2.030   |
| Hydracarina (%)                       | t-equal                  | log10(x+1)          | NO                                    | 0.134   | -0.9                                             | Lake Littoral      | 5.3            | 2.6                | 1.2            | 3.5     | 4.4    | 9.9     |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 2.8            | 2.0                | 0.9            | 0.0     | 3.5    | 5.1     |
| Ostracoda (%)                         | t-equal                  | log10               | YES                                   | < 0.001 | -2.0                                             | Lake Littoral      | 37.9           | 14.5               | 6.5            | 26.7    | 36.2   | 62.6    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 8.6            | 4.1                | 1.8            | 3.5     | 7.7    | 14.5    |
| Chironomidae (%)                      | t-equal                  | none                | YES                                   | 0.001   | 2.3                                              | Lake Littoral      | 52.6           | 15.6               | 7.0            | 26.9    | 59.0   | 66.4    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 87.9           | 4.2                | 1.9            | 82.3    | 87.2   | 92.7    |
| Metal-Sensitive Chironomidae (%)      | t-equal                  | none                | NO                                    | 0.773   | 0.3                                              | Lake Littoral      | 28.8           | 9.5                | 4.3            | 15.6    | 32.5   | 38.7    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 31.5           | 17.6               | 7.9            | 7.9     | 38.0   | 49.3    |
| Collector-Gatherers (%)               | t-equal                  | log10               | NO                                    | 0.917   | 0.0                                              | Lake Littoral      | 63.1           | 11.4               | 5.1            | 53.6    | 60.3   | 81.5    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 62.9           | 15.0               | 6.7            | 45.4    | 56.1   | 79.0    |
| Filterers (%)                         | t-equal                  | none                | NO                                    | 0.701   | 0.4                                              | Lake Littoral      | 27.1           | 9.8                | 4.4            | 14.4    | 29.2   | 38.0    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 30.7           | 17.5               | 7.8            | 7.9     | 38.0   | 49.3    |
| Shredders (%)                         | t-equal                  | none                | NO                                    | 0.396   | -0.5                                             | Lake Littoral      | 3.9            | 3.3                | 1.5            | 0.6     | 3.2    | 7.4     |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 2.2            | 2.3                | 1.0            | 0.0     | 2.5    | 5.3     |
| Clingers (%)                          | t-equal                  | none                | NO                                    | 0.863   | 0.2                                              | Lake Littoral      | 31.9           | 9.3                | 4.2            | 17.9    | 33.5   | 41.6    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 33.5           | 16.9               | 7.6            | 13.1    | 41.5   | 52.8    |
| Sprawlers (%)                         | t-equal                  | none                | NO                                    | 0.466   | 0.6                                              | Lake Littoral      | 57.9           | 12.1               | 5.4            | 41.0    | 57.2   | 73.8    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 64.8           | 16.2               | 7.2            | 45.5    | 58.5   | 87.0    |
| Burrowers (%)                         | t-equal                  | none                | YES                                   | 0.011   | -1.7                                             | Lake Littoral      | 10.2           | 4.9                | 2.2            | 4.6     | 8.3    | 17.3    |
|                                       |                          |                     |                                       |         |                                                  | Lake Profundal     | 1.7            | 2.9                | 1.3            | 0.0     | 0.0    | 6.7     |

Grey shading indicates statistically significant difference between habitat types based on p-value  $\leq 0.10$ .

Blue shaded values indicate significant difference (p-value  $\leq 0.10$ ) that was also outside of a CES of  $\pm 2$  SD, indicating that the difference was ecologically meaningful.

<sup>a</sup> Magnitude calculated by comparing the difference between the lake littoral and profundal area means divided by the littoral area standard deviation.



## B7 FISH POPULATION

### B7.1 Lotic Environments

Fish population sampling of lotic habitats is not required as part of the Mary River Project CREMP (see NSC 2014). In part, this reflects the fact that fish can only inhabit local study area creeks/rivers for a short period each year (i.e., July to September) as a result of complete freezing/desiccation of these lotic habitats over much of the year. In addition, sampling of juvenile arctic charr within a representative lotic habitat is conducted for the federal Environmental Effects Monitoring (EEM) program to meet Metal and Diamond Mining Effluent Regulation requirements (Baffinland 2015; Minnow 2018b, 2021).

### B7.2 Lentic Environments (Reference Lake 3)

The Reference Lake 3 fish community has historically been composed of arctic charr and ninespine stickleback. The relative abundance of both species has been low at Reference Lake 3 based on low electrofishing and gill netting catches and catch-per-unit-effort (CPUE) for each species in all previous studies (Minnow 2018a, 2019, 2020), and predominantly arctic charr were captured at the reference lake in 2020 (Appendix Tables G.1 and G.2). Suitable numbers of arctic charr were captured at nearshore habitat of Reference Lake 3 (i.e., 100 individuals) to allow evaluation of mine-related effects on survival, growth, and condition of fish collected at the mine-exposed lake shorelines. For these fish, young-of-the-year (YOY) individuals were generally distinguishable from the 1+ to 5+ age classes at a fork length of 4.5 cm based on the evaluation of length-frequency distributions coupled with supporting age determinations (Appendix Figure B.8). In 2015 and 2019, YOY arctic charr captured at nearshore habitat were not able to be distinguished from older age classes at Reference Lake 3 (Appendix Figure B.8). However, population comparisons of nearshore arctic charr captured between the mine-exposed and reference lakes from 2016 to 2018 and 2020 were completed separately for YOY and non-YOY data sets. Temporal comparisons of the 2015 to 2020 nearshore arctic charr data indicated that fish sizes in 2020 were within range of those captured in previous years, with condition of fish within the critical effect size for growth endpoints of  $\pm 25\%$  for 2020 compared to all years except 2018 for non-YOY (Appendix Table B.10). The data show that larger fish are likely to naturally exhibit lower condition than smaller sized fish (Appendix Table B.10; Appendix Figure B.9). Overall, the Reference Lake fish population data indicated that some year-to-year differences in fish population endpoints can be expected naturally at local study area lakes.

Low numbers of arctic charr were captured at littoral/profundal areas of Reference Lake 3 in 2020 (i.e., 69 individuals) despite application of similar fishing effort to that used at the



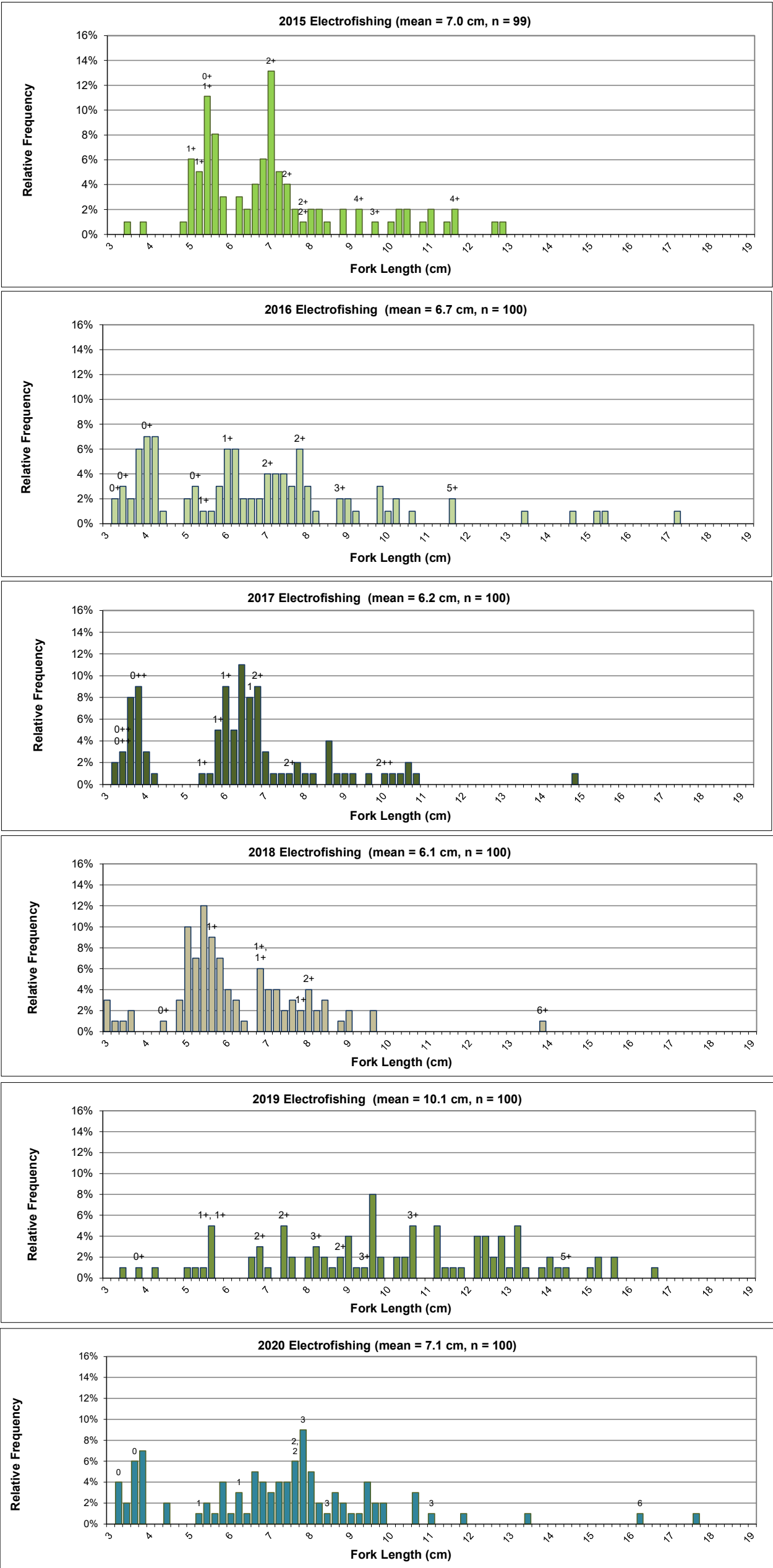


**Figure B.8: Length-frequency Distributions for Arctic Charr Captured by Backpack Electrofishing and Gill Netting at Reference Lake 3 (REF3) in August 2015 to 2020, Mary River Project CREMP**

Note: Fish ages are shown above the bars, where available.



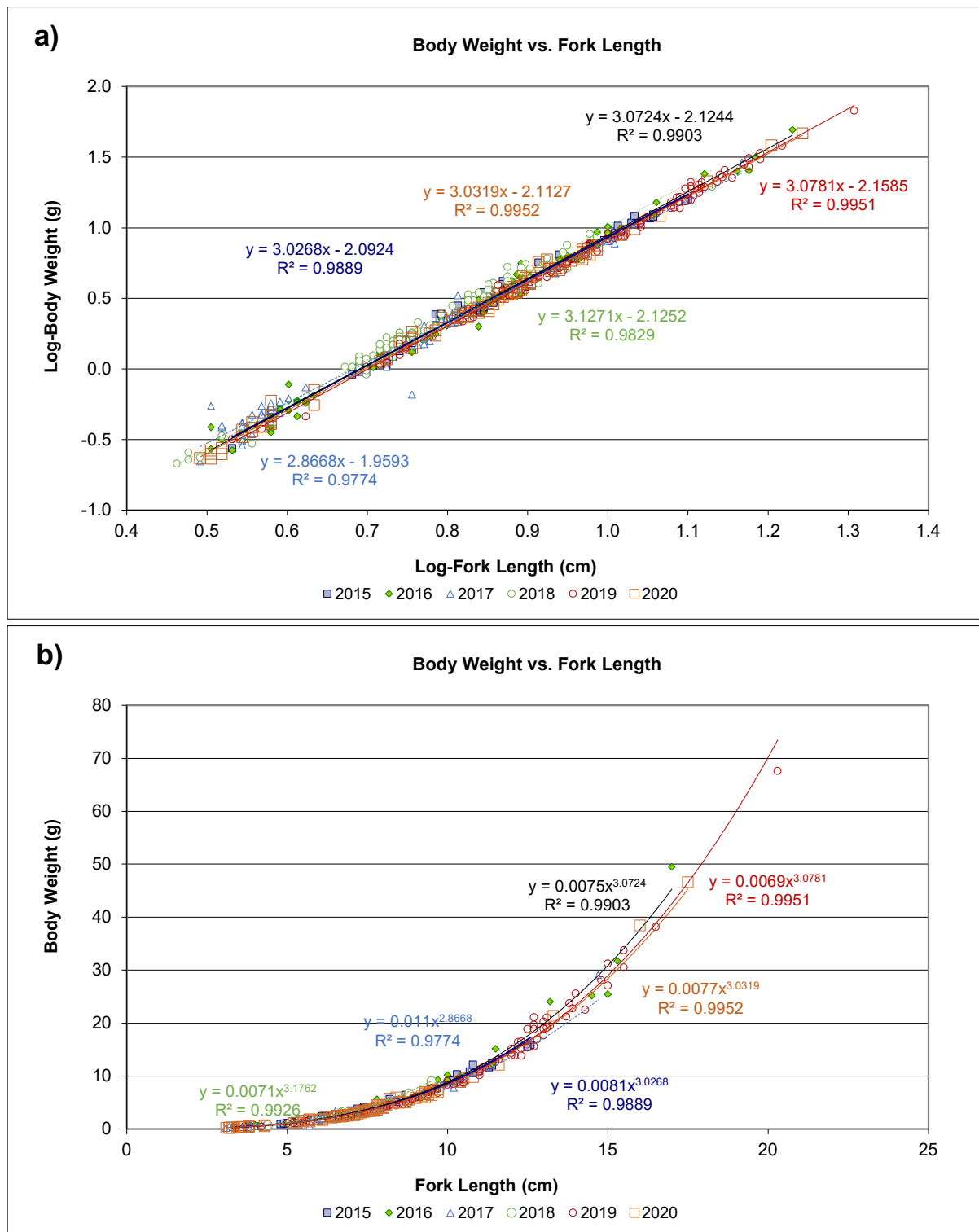


**Figure B.9: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Reference Lake 3 in August from 2015 to 2020 using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP**

mine-exposed study lakes (Appendix Table G.2). However, unlike previous studies conducted from 2015 to 2018 that resulted in catches ranging from 1 to 27, the sample size in 2020 was sufficient as a basis for conducting meaningful statistical comparison with the mine-exposed lakes to evaluate mine-related effects on the population of reproductive-aged arctic charr. Notably, because arctic charr can show differential growth rates between the sexes (females grow faster; Jonsson et al. 1988; Skúlason et al. 1996; Gulseth and Nilssen 2001), natural differences in sex ratios between study areas could potentially result in falsely attributing differences in growth and/or condition between mine-exposed and reference areas to mine-related influences. Thus, the inability to definitively determine arctic charr sex using external characteristics when applying a non-lethal sampling approach could confound data interpretation. To determine whether differences in sex ratios could potentially confound the interpretation of the CREMP arctic charr health assessment, growth and condition were compared between male and female Arctic charr collected at Camp, Sheardown and Mary lakes during the baseline period as part of the 2015 CREMP (Minnow 2016a). No significant differences in growth and condition were indicated between males and females based on this analysis, suggesting that a non-lethal study approach is unlikely to bias the evaluation of mine-related effects on fish health as part of the CREMP. Contrary to the published literature, the absence of differences in arctic charr growth and condition between males and females at Mary River Project local study area lakes may be explained by naturally slow growth rates and low spawning frequency (i.e., once every 2 to 4 years) at high Arctic areas, and also by low gonadosomatic index (GSI) at the time that sampling is normally conducted for the Mary River Project CREMP (i.e., August).



## B8 CREMP IMPLICATIONS

This overview of reference conditions was included in the CREMP to provide context and perspective regarding key chemical, physical, and biological features of the CREMP reference study areas. Key implications of reference area features that could affect the ability of the CREMP to evaluate mine-related effects at mine-exposed waterbodies that were identified through the 2016 to 2020 reference area overviews include the following:

- **Federal Water Quality Guidelines (WQG) are not applicable for aqueous phenol concentrations.** Aqueous concentrations of phenols were routinely elevated above WQG at the CREMP creek, river and lake reference stations in 2015 and 2016. Correlation analysis indicated a significant, positive relationship between phenol and both nitrate and DOC concentrations in the 2015 and 2016 CREMP, suggesting that high phenol concentrations in waterbodies near the Mary River Project mine were associated with influences from natural organic composition. Therefore, phenol concentration comparisons against applicable WQG did not serve as a focus for discussion as part of the 2016 to 2020 CREMP.
- **Greater reliance on the use of dissolved metals concentrations for assessing mine-related influences on aqueous metal concentrations at waterbodies used for the CREMP.** Total aluminum concentrations were routinely elevated, and other metals including (total) iron periodically elevated, above WQG at creek, river, and/or lake reference areas used for the CREMP from 2015 to 2020, and historically in baseline studies. Significant positive correlations between total concentrations of these metals and turbidity were identified using the 2015 to 2020 data sets which suggested that these metals were likely bound to and/or composed the physical make-up of suspended particulate materials in water samples. This was supported by a low ratio of dissolved to total concentrations of metals such as aluminum, iron, and manganese in reference water samples from 2015 to 2020. Accordingly, greater emphasis should be placed on comparison of dissolved metal concentrations for assessing potential mine-related influences on water quality as part of the CREMP studies.
- **Use of fall sampling event water quality data to allow the most conservative evaluation of potential mine-related influences on water chemistry.** Water chemistry at lotic reference stations showed distinct seasonal changes in parameter concentrations during the baseline, and 2015 to 2020 studies. In general, conventional parameters, anions, and total metals were observed at lowest concentrations in spring, with intermediate concentrations in the summer, and highest



concentrations observed during the fall in each year. Therefore, although water chemistry data from winter, spring, and summer sampling events were examined, the fall water chemistry data generally served as the focus for the evaluation of potential mine-related influences on water quality at the mine-exposed lakes in CREMP studies conducted from 2016 to 2020.

- **Use of average water chemistry and chlorophyll-a data for lake water quality/phytoplankton monitoring stations.** No consistent differences in water chemistry or chlorophyll-a concentrations were observed between the surface and bottom of the water column at Reference Lake 3 stations from 2015 to 2020. Therefore, the evaluation of water chemistry and phytoplankton productivity among stations and study areas for the 2016 to 2020 Mary River Project CREMP studies was based on average water chemistry and chlorophyll-a values from the water column surface and bottom for each lake station.
- **Consider updating of the AEMP sediment quality benchmarks.** Arsenic, chromium, copper, iron, manganese, and phosphorus have been observed at concentrations above the AEMP sediment quality benchmarks in sediment at Reference Lake 3 in CREMP studies conducted from 2015 to 2020. This suggested that the AEMP benchmarks for these metals may be overly conservative and therefore, to improve the applicability of the AEMP benchmarks for these metals, consideration should be given to incorporating reference lake data into derivation of updated sediment quality AEMP benchmarks.
- **Focus lake benthic invertebrate community survey on littoral zone.** Benthic invertebrate community data collected at Reference Lake 3 from 2015 to 2020 consistently indicated that, similar to most lakes, benthic invertebrate community features can be expected to naturally change with depth. In general, as depth increases, lower benthic invertebrate density and richness typically occurs. The occurrence of naturally low density and/or richness can, in turn, limit the ability to distinguish adverse effects associated with a project. Therefore, in order to maximize the confidence in the benthic invertebrate community analysis results, the littoral zone should serve as the focus for the lake benthic invertebrate community survey analysis for the CREMP.
- **Adopting of standard CES for benthic invertebrate community and fish population endpoints into the CREMP.** Year-to-year evaluation of reference creek and lake habitat used for the CREMP has indicated that benthic invertebrate and fish





populations differences between years can be expected to vary within the CES set out for use under the federal EEM program (Munkittrick et al. 2009). Therefore, the use of established CES for defining effects appears to be applicable to the Mary River Project CREMP.



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**APPENDIX C**  
**WATER QUALITY DATA**

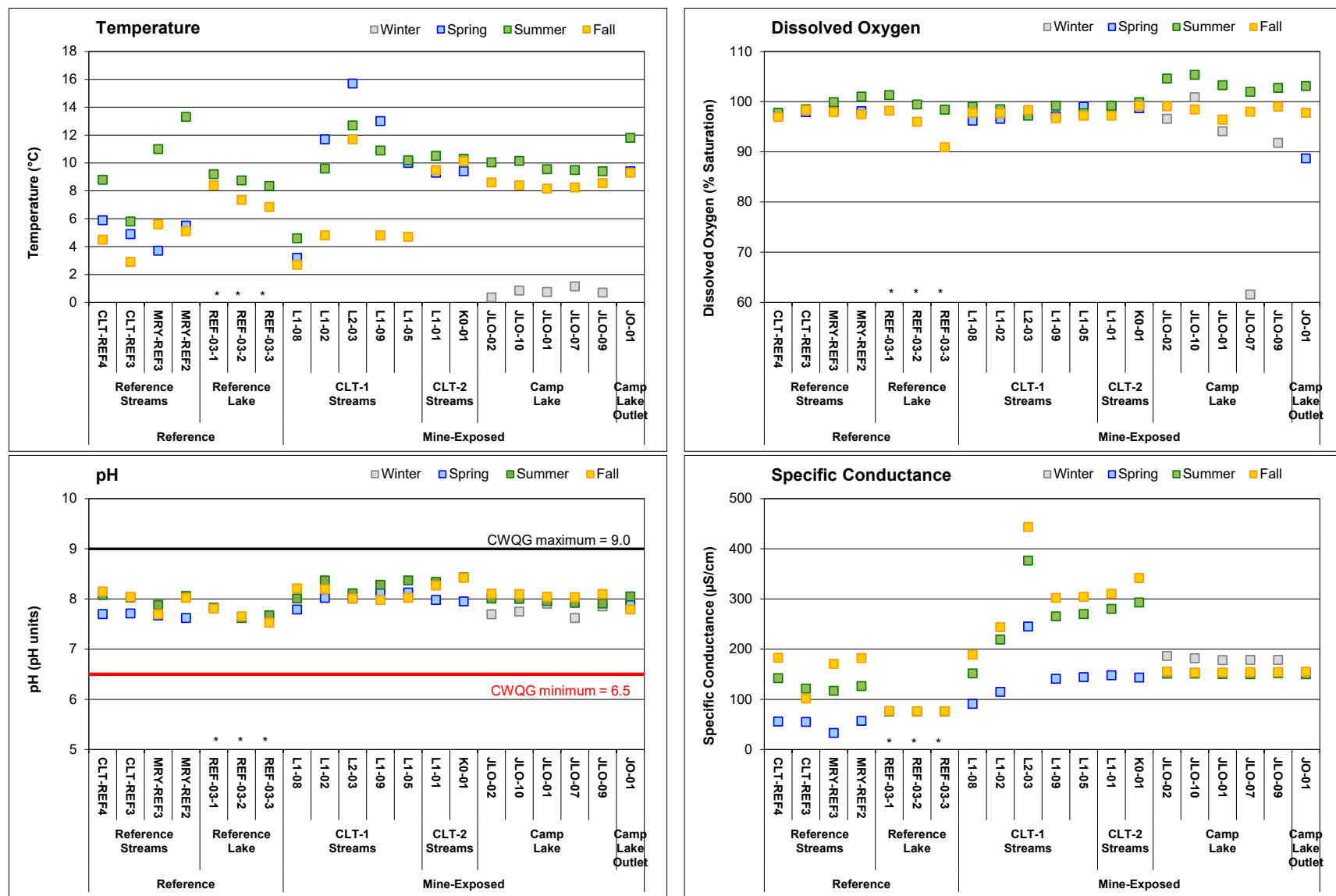


**Figure C.1: Comparison of *In Situ* Water Quality Measured at Camp Lake System Water Quality Monitoring Stations in Winter, Spring, Summer, and Fall 2020, Mary River Project CREMP**

Notes: Lake values represent mean of surface and bottom *in situ* water quality measurements. Streams were not sampled in winter. Lakes were not sampled in spring.

\* Reference Lake 3 (REF-03) was not sampled in winter.

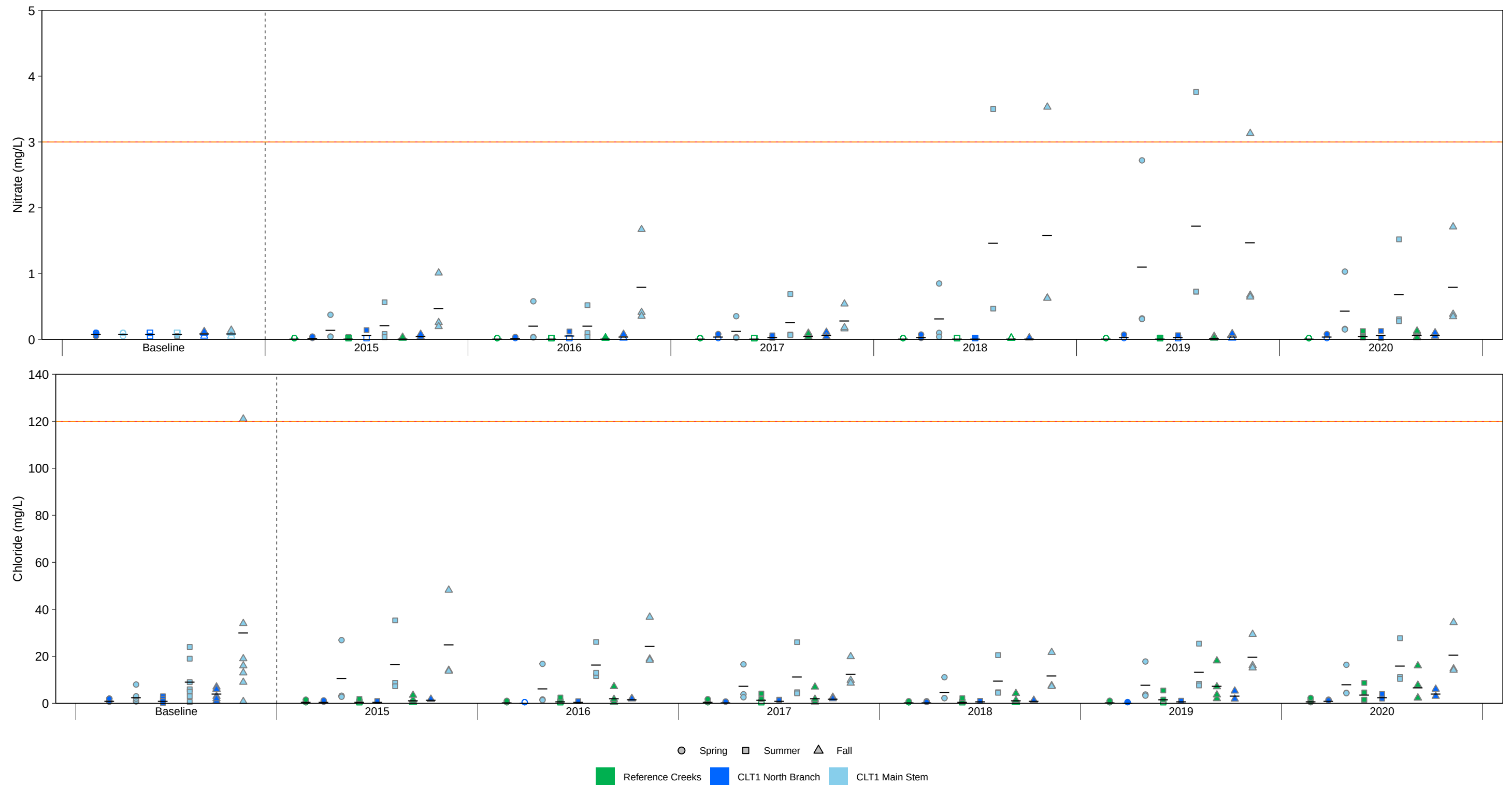


**Figure C.2: Temporal Comparison of Water Chemistry at Camp Lake Tributary 1 (CLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

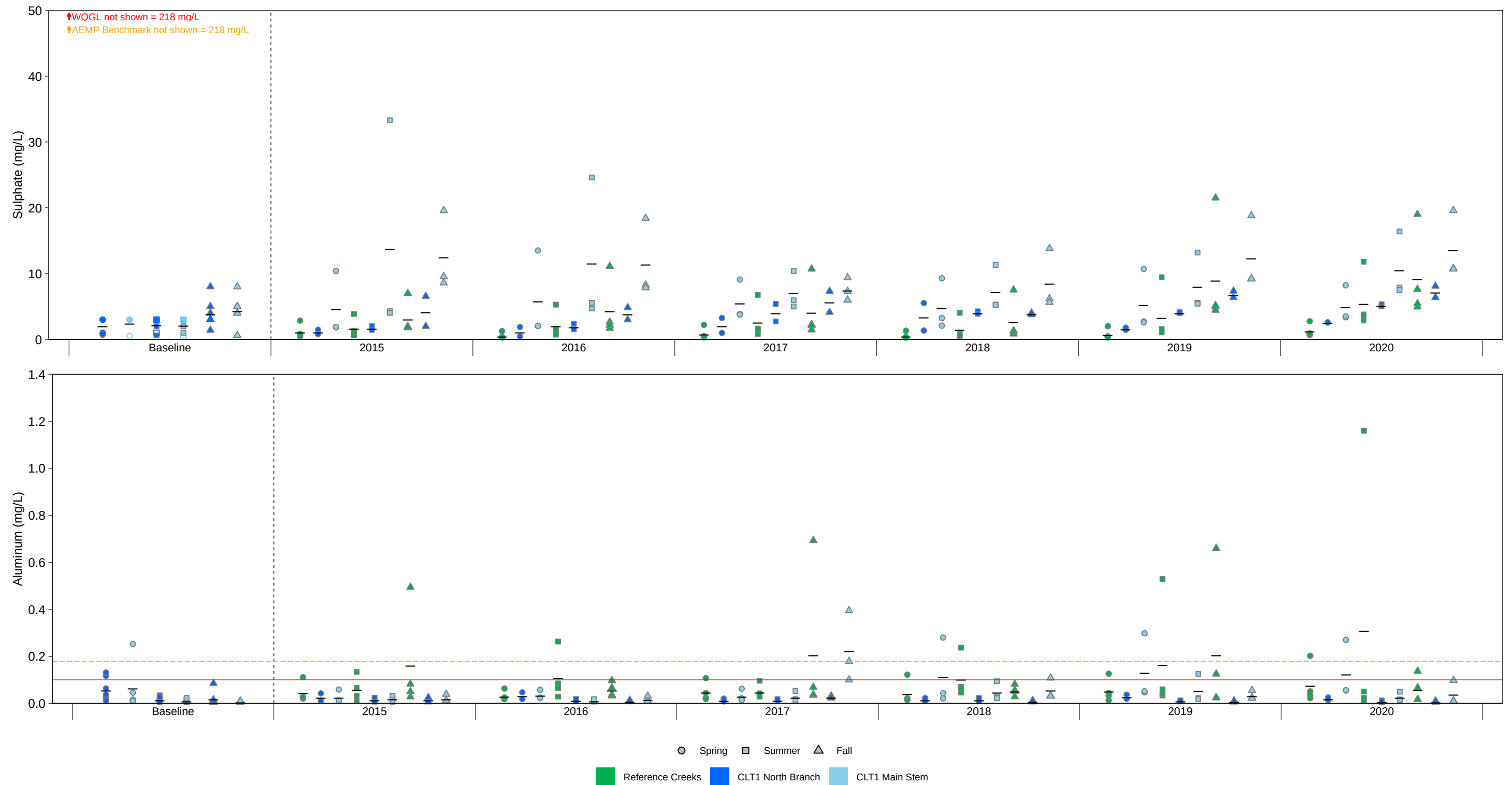


**Figure C.2: Temporal Comparison of Water Chemistry at Camp Lake Tributary 1 (CLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.



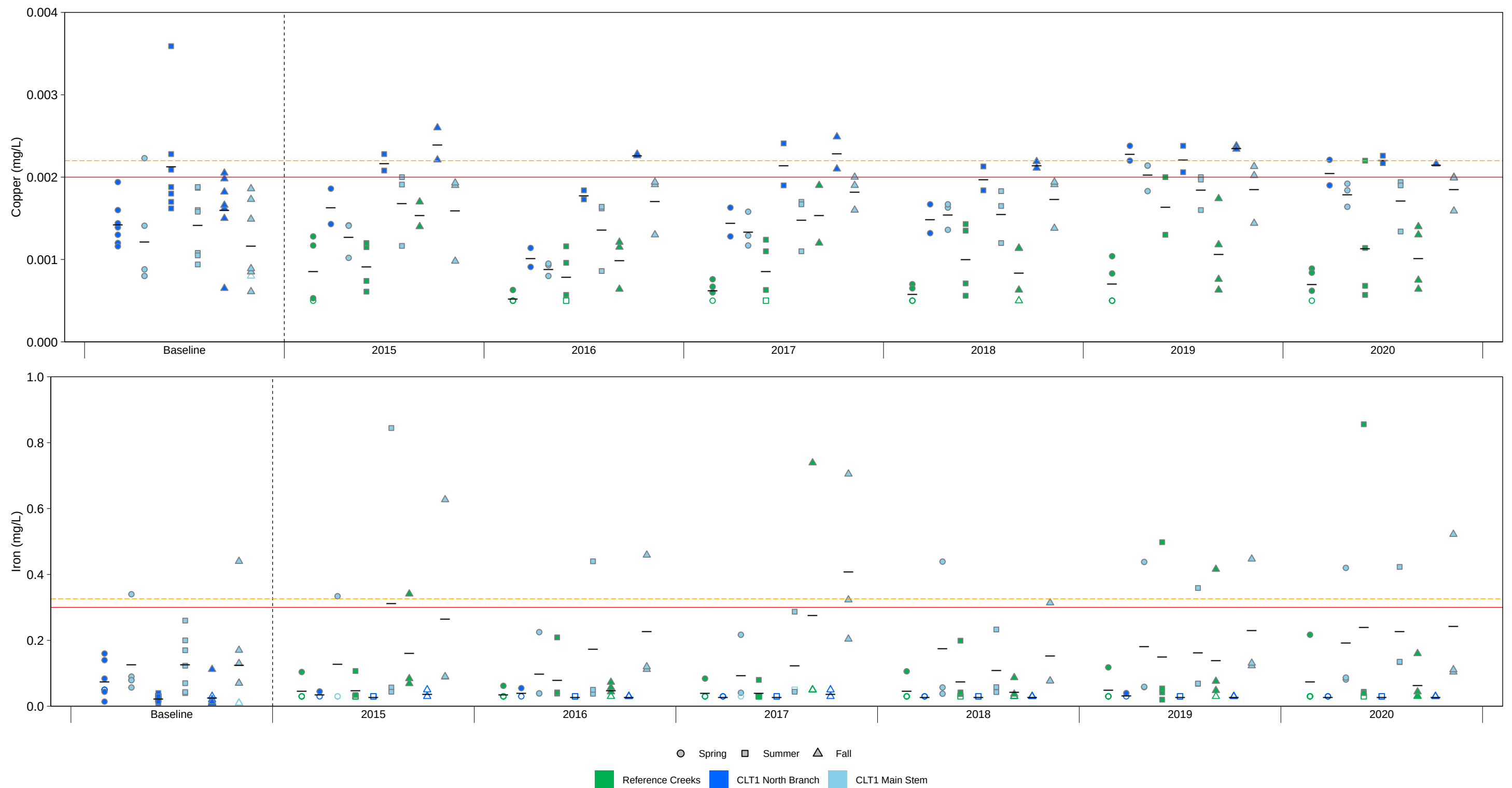


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Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

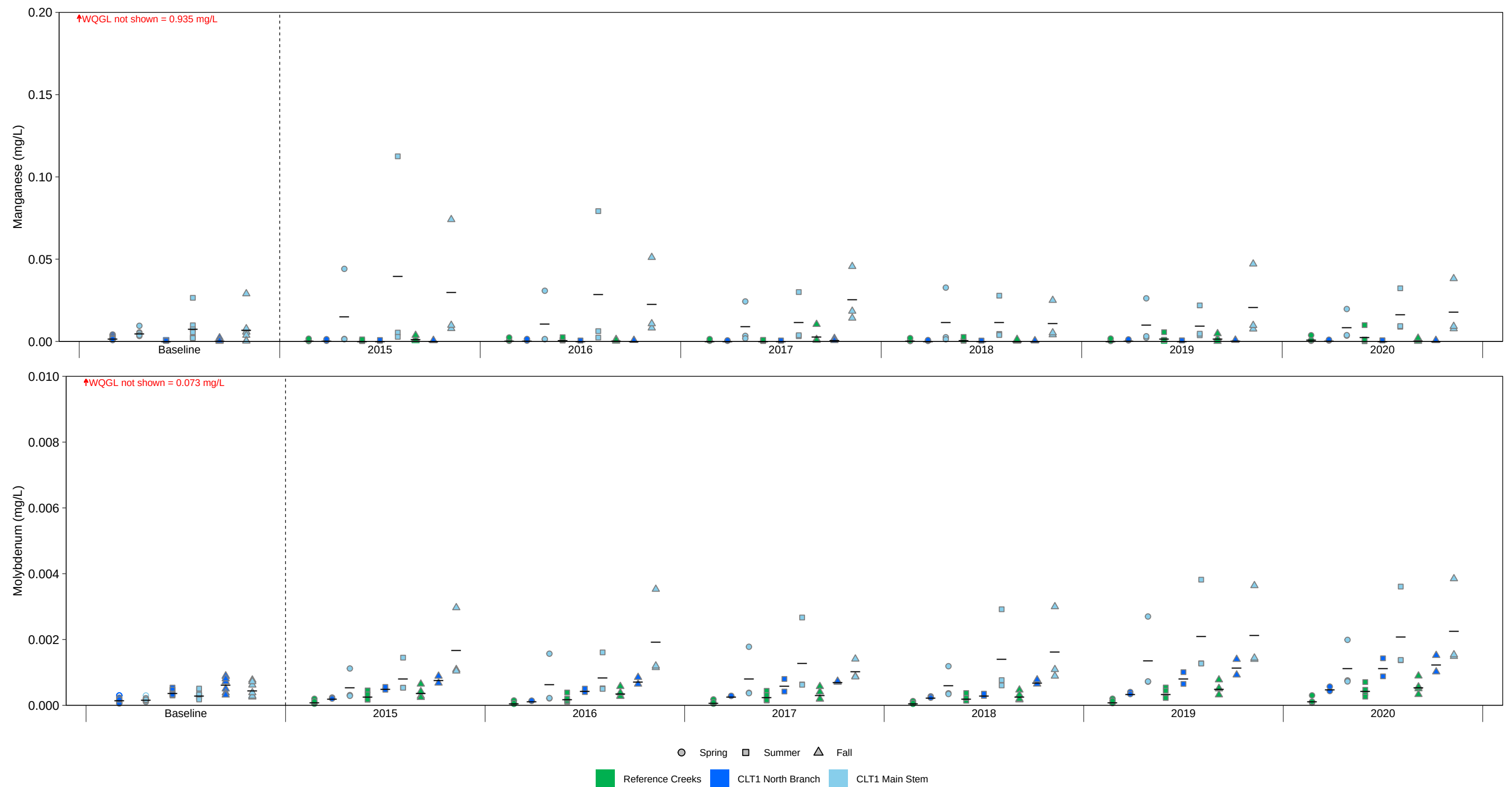


**Figure C.2: Temporal Comparison of Water Chemistry at Camp Lake Tributary 1 (CLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

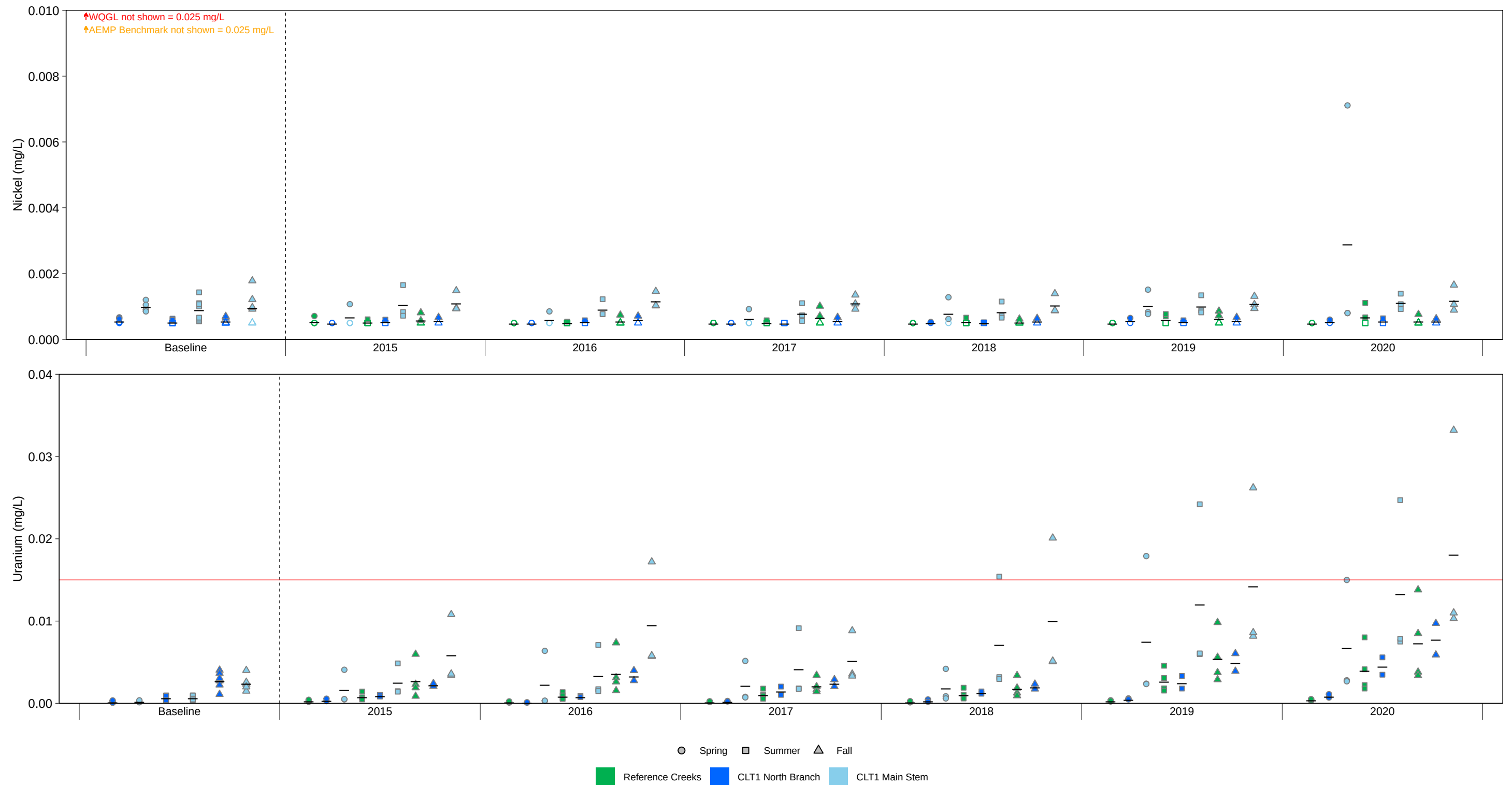


**Figure C.2: Temporal Comparison of Water Chemistry at Camp Lake Tributary 1 (CLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

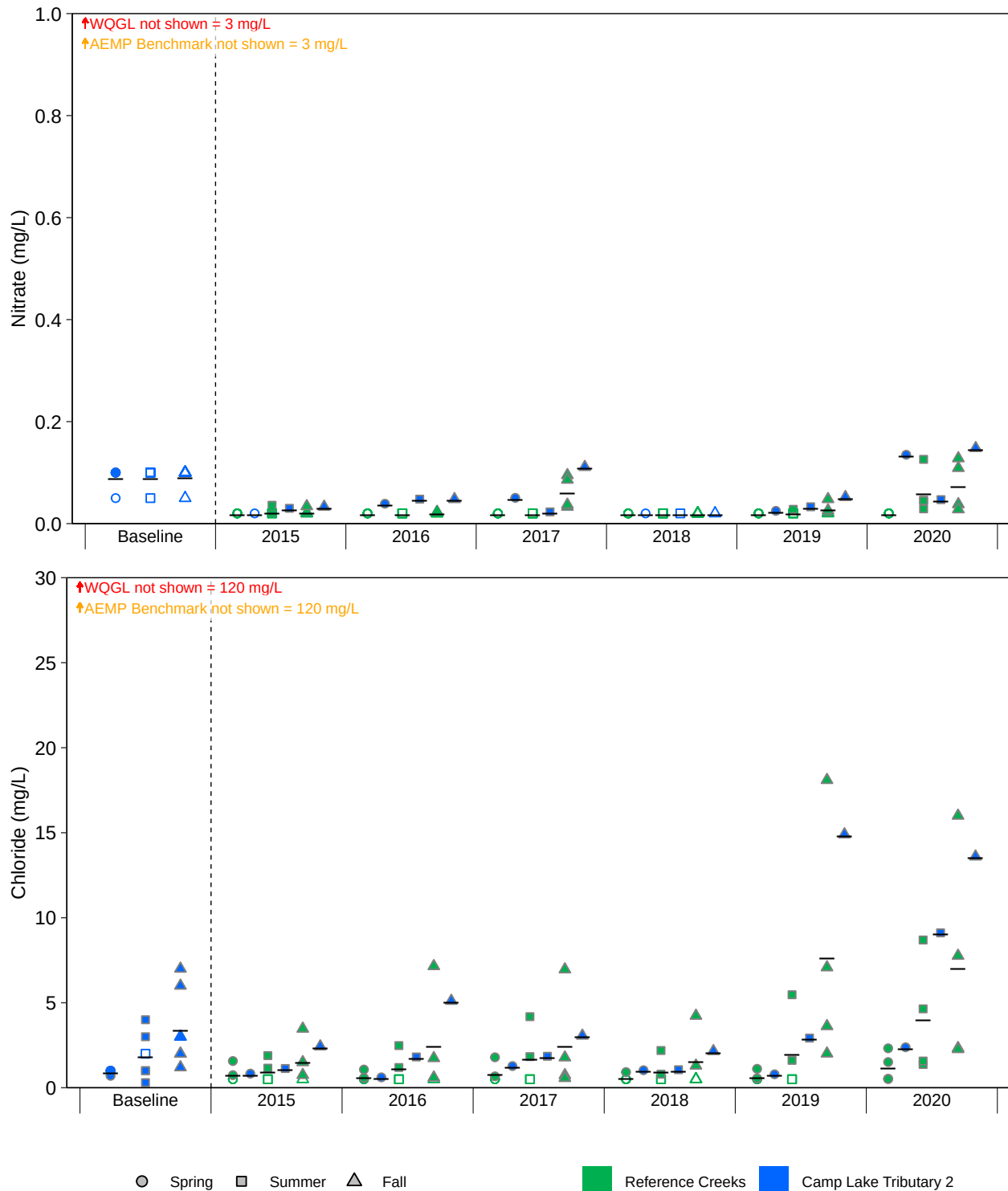


**Figure C.3: Temporal Comparison of Water Chemistry at Camp Lake Tributary 2 (CLT2) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

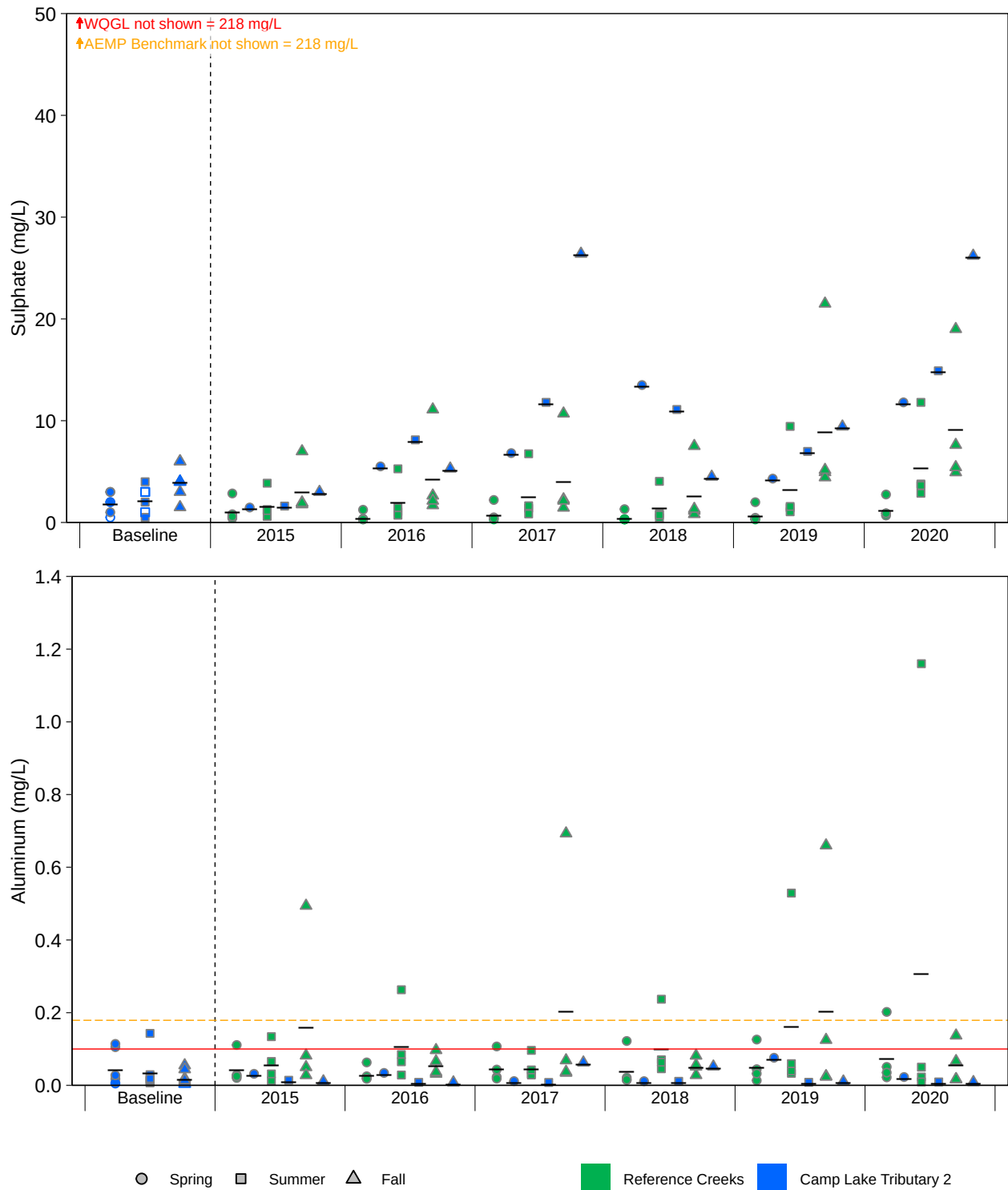


**Figure C.3: Temporal Comparison of Water Chemistry at Camp Lake Tributary 2 (CLT2) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

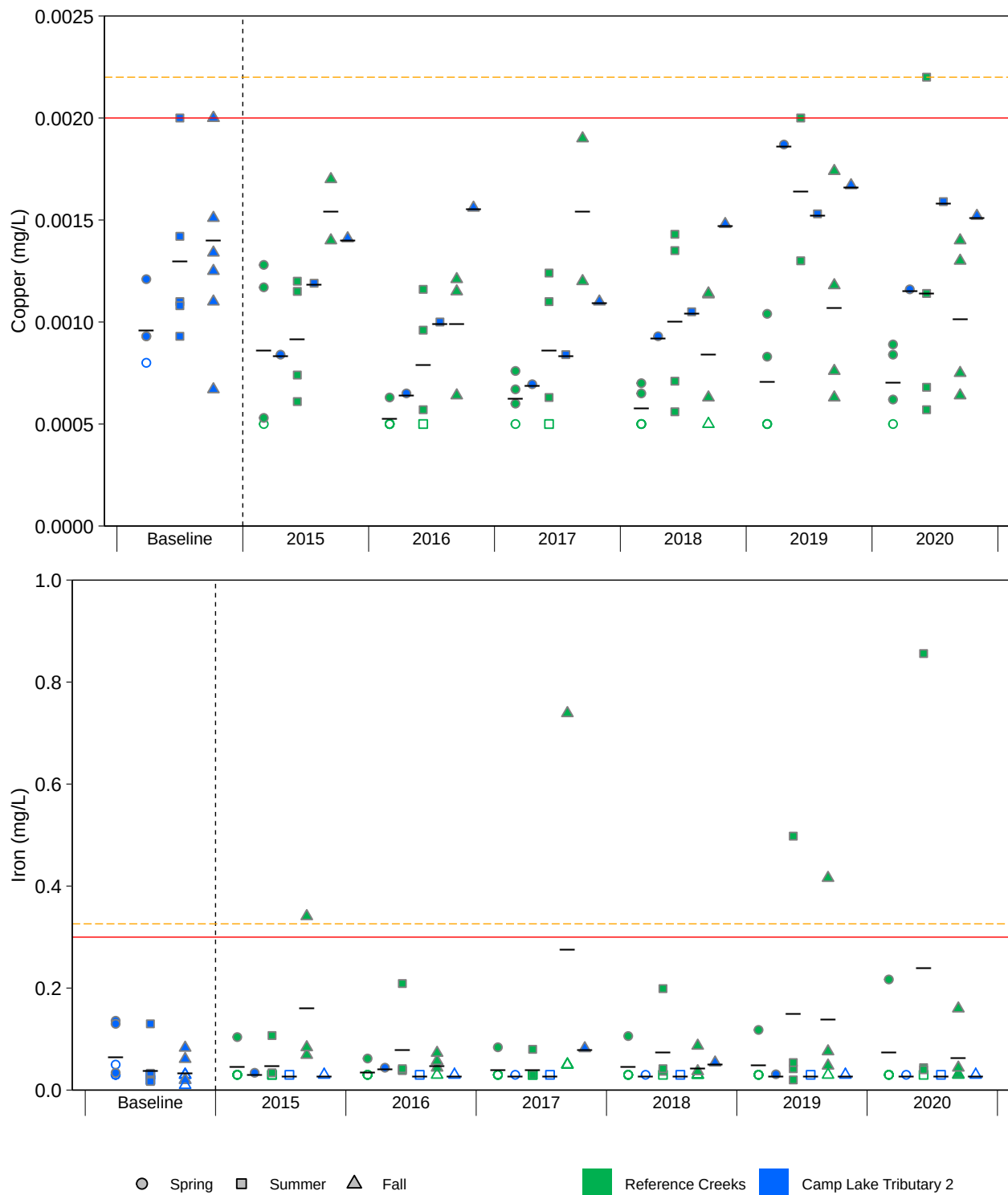


**Figure C.3: Temporal Comparison of Water Chemistry at Camp Lake Tributary 2 (CLT2) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

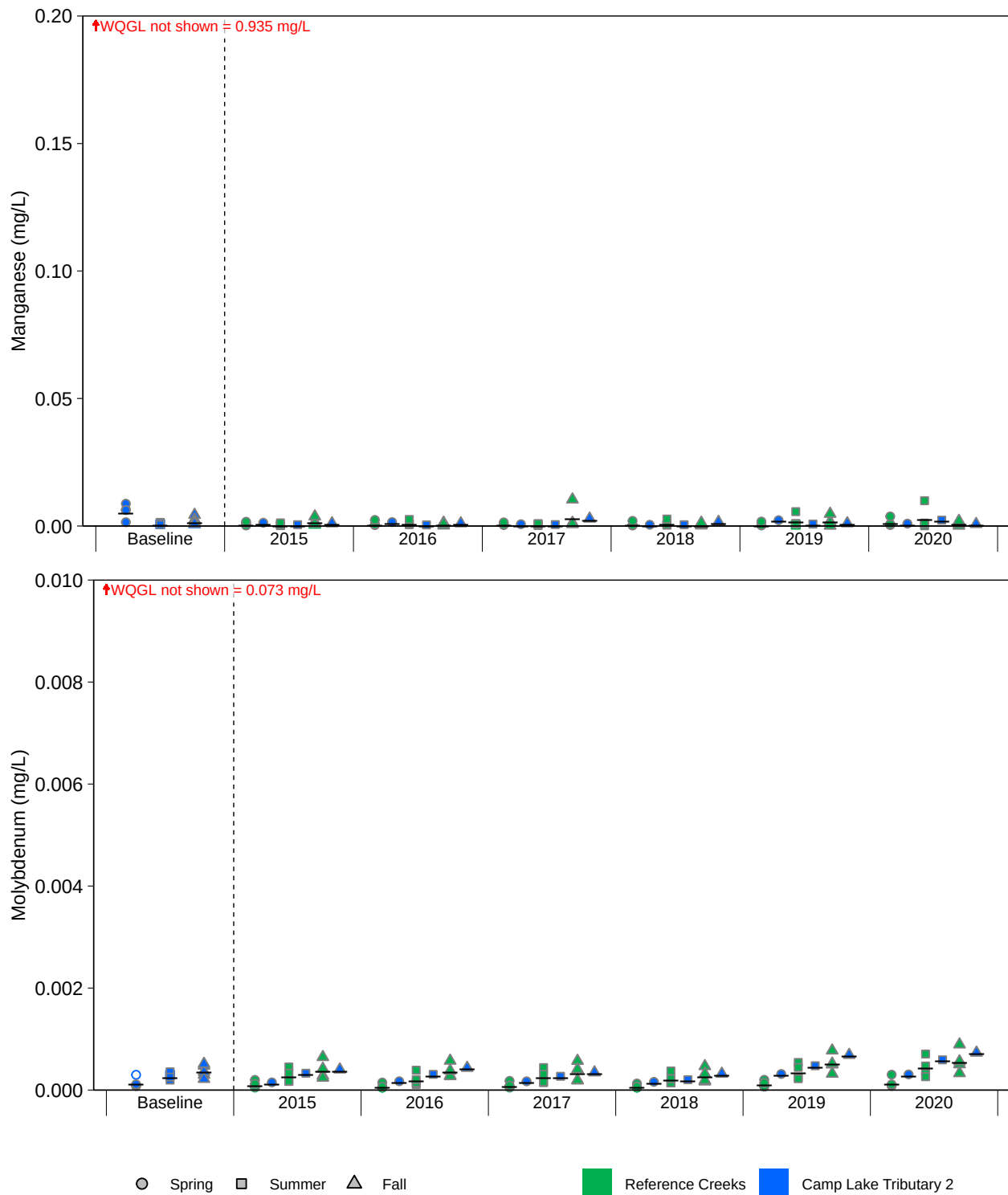


**Figure C.3: Temporal Comparison of Water Chemistry at Camp Lake Tributary 2 (CLT2) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.



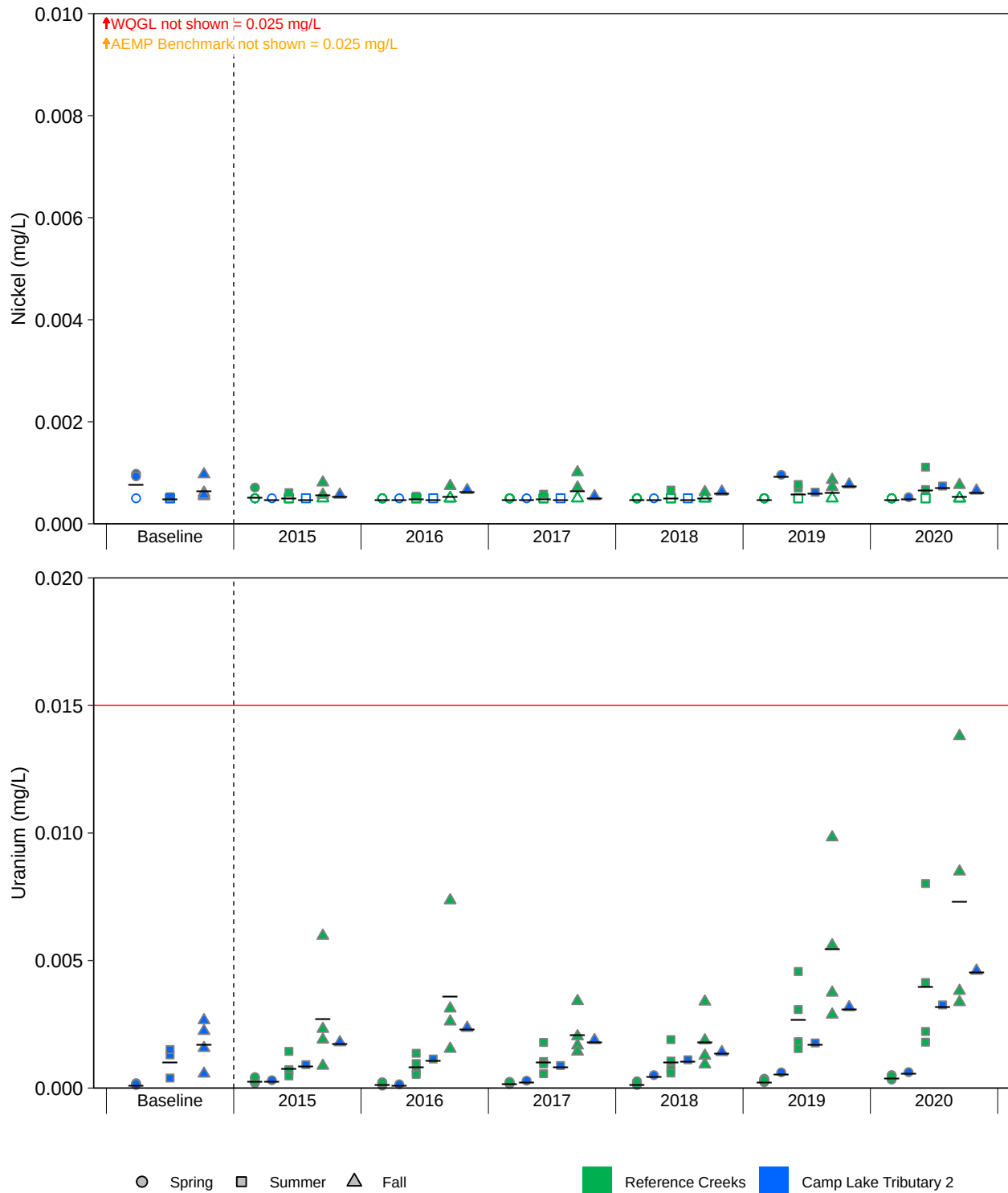


**Figure C.3: Temporal Comparison of Water Chemistry at Camp Lake Tributary 2 (CLT2) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

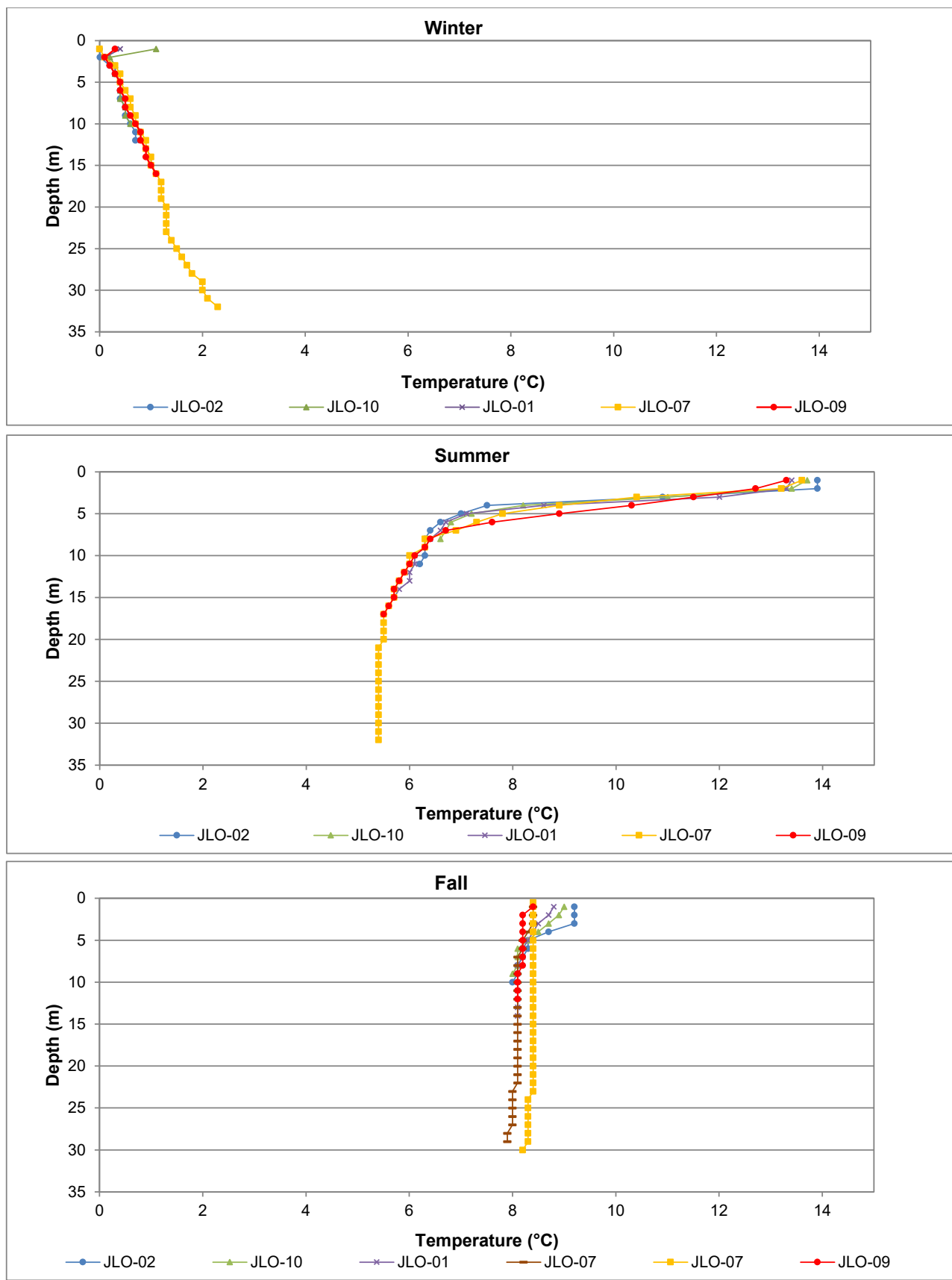


**Figure C.4:** Vertical Profiles of Temperature Measured at Camp Lake in Winter, Summer, and Fall, 2020

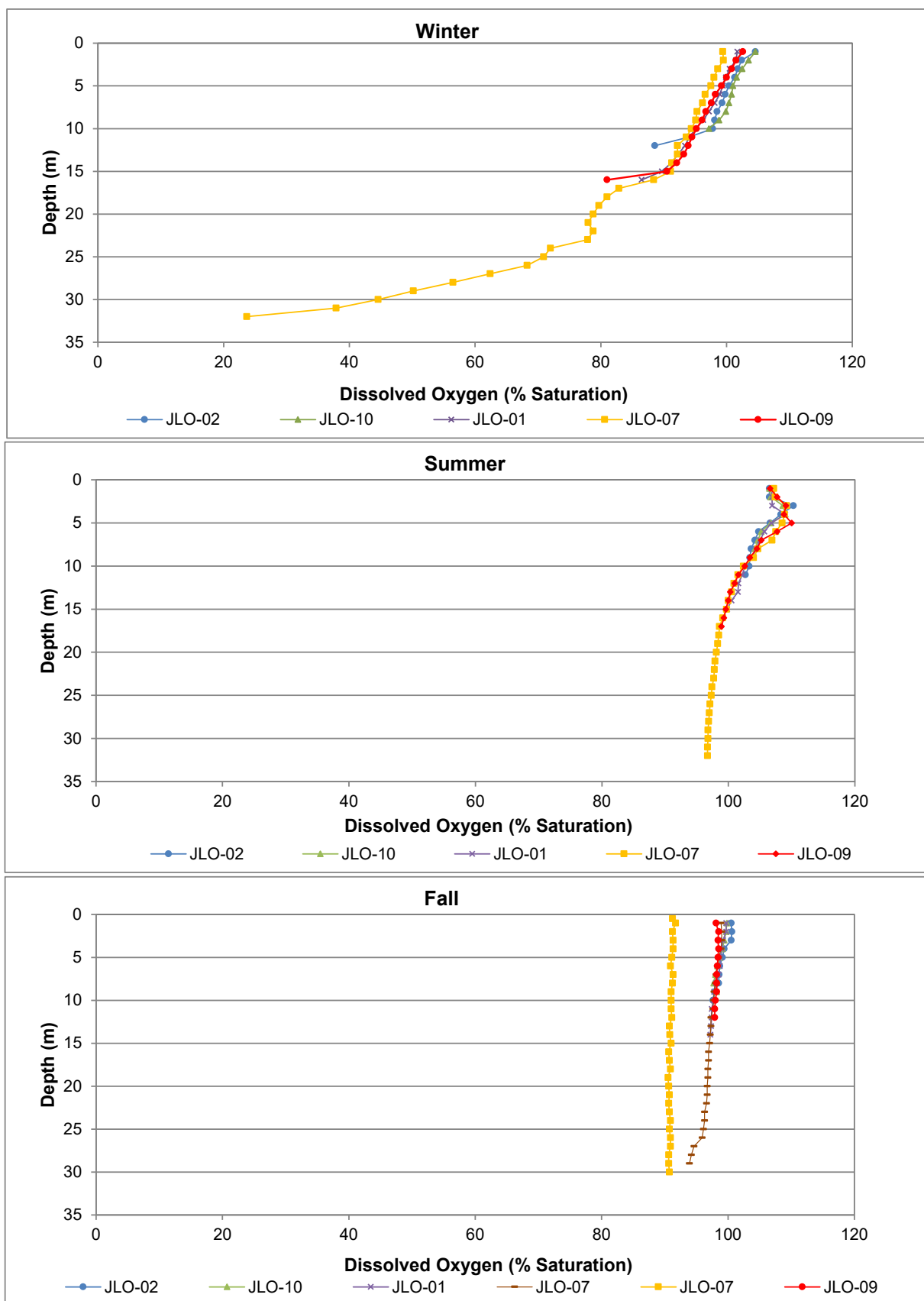


**Figure C.5:** Vertical Profiles of Dissolved Oxygen Measured at Camp Lake in Winter, Summer, and Fall, 2020

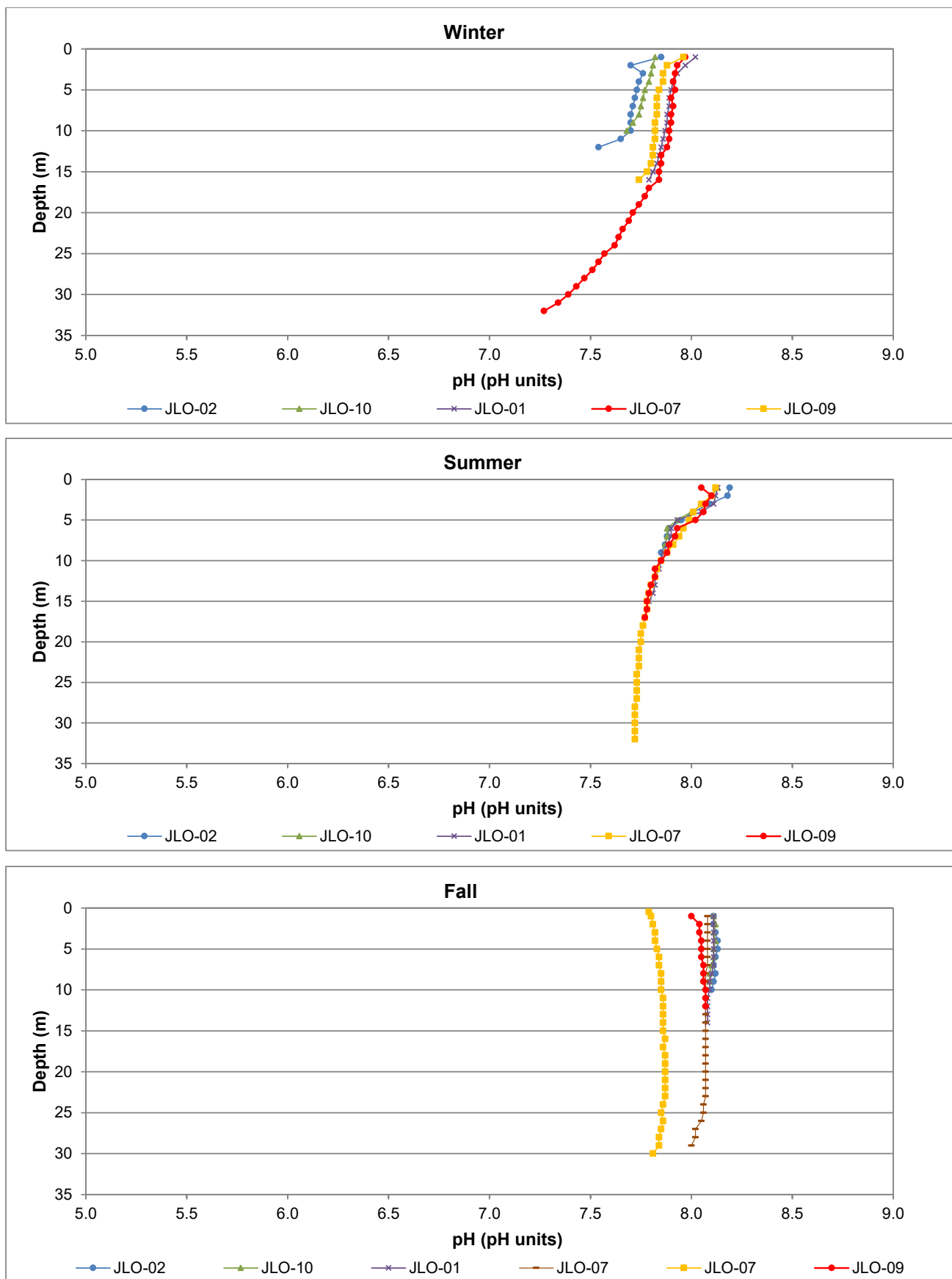


**Figure C.6: Vertical Profiles of pH Measured at Camp Lake in Winter, Summer, and Fall, 2020**

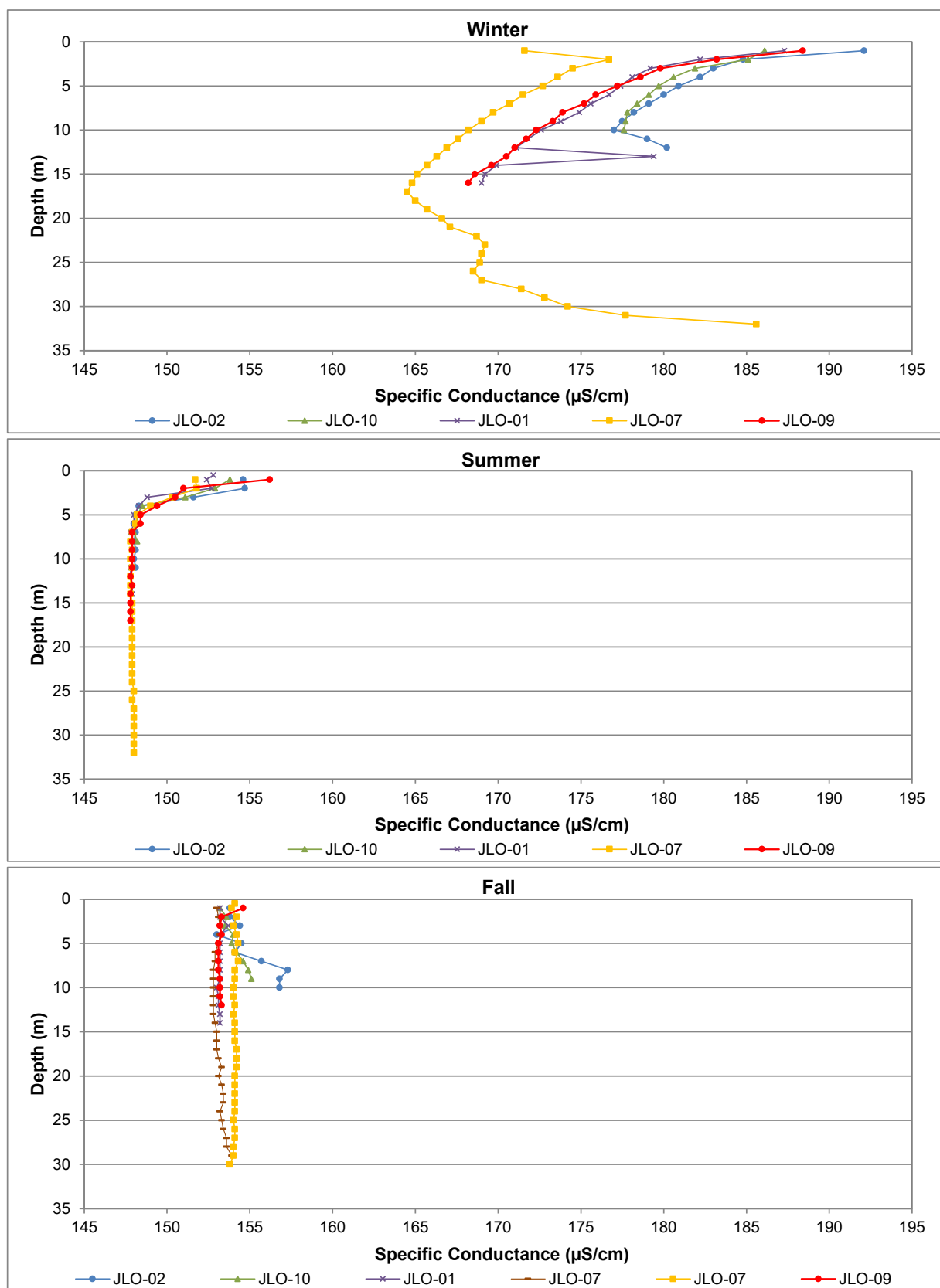


**Figure C.7:** Vertical Profiles of Specific Conductance Measured at Camp Lake in Winter, Summer, and Fall, 2020

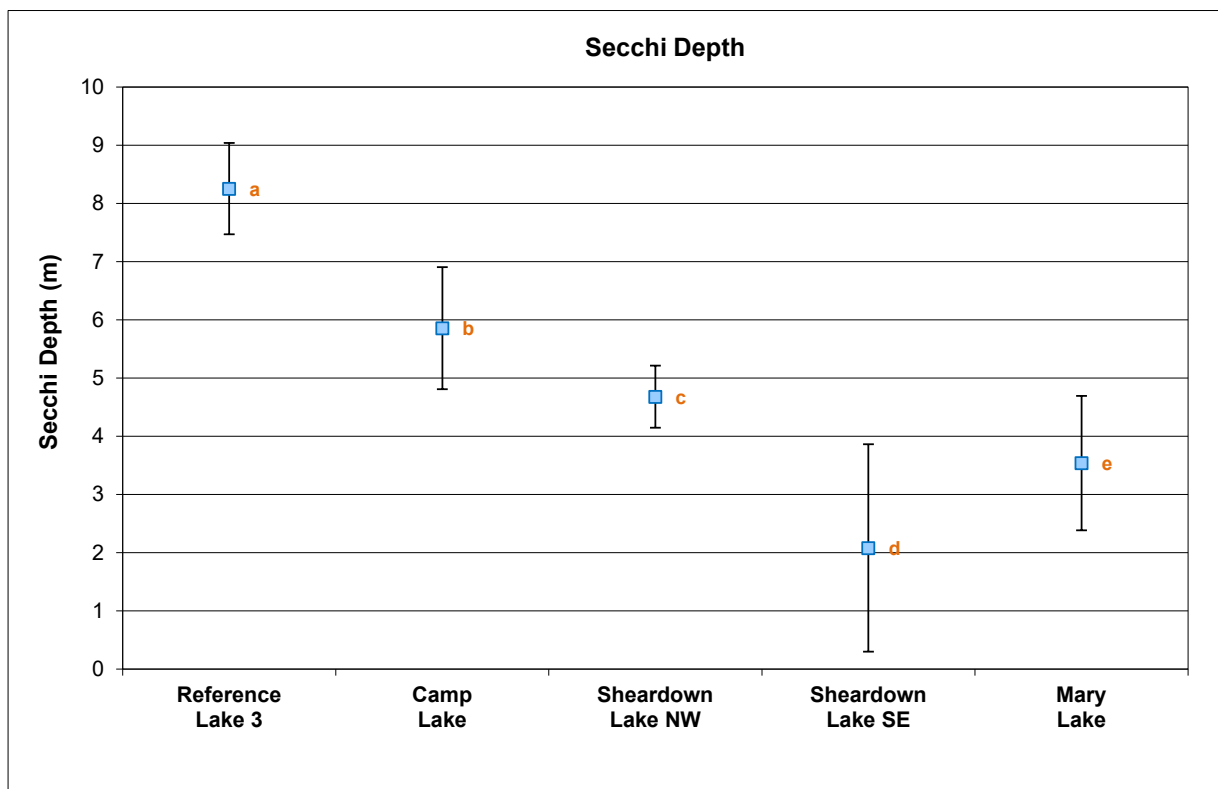


**Figure C.8: Comparison of Secchi Depth (mean  $\pm$  SD) Measured at the Mary River Project Lake Benthic Invertebrate Community Stations, August 2020**

Notes: The same letter(s) next to study area data points indicate no significant difference between study areas. Sample size (n) was 10 for all lakes except Sheardown Lake NW, where n was 9.

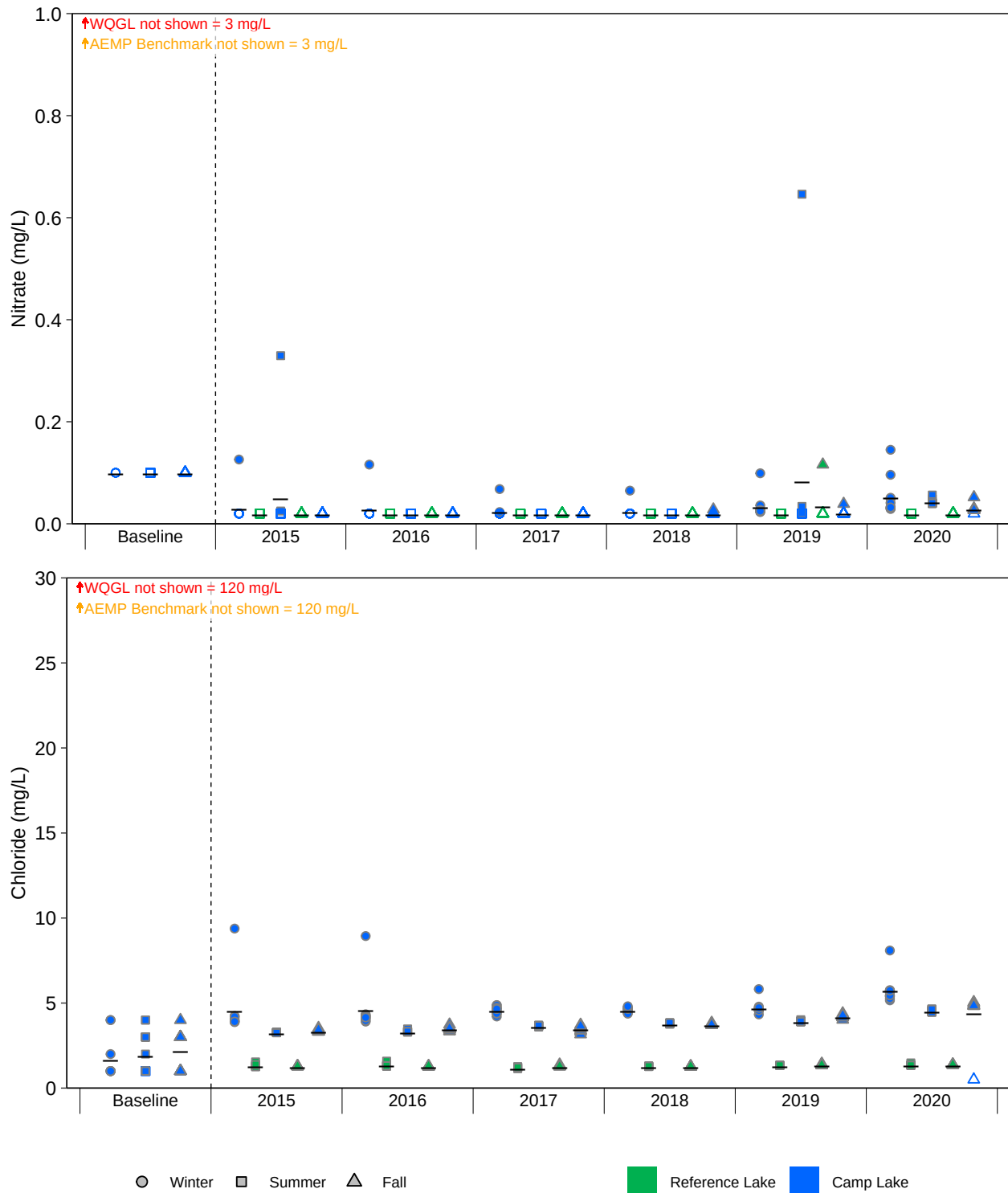


**Figure C.9: Temporal Comparison of Water Chemistry at Camp Lake (JLO) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.



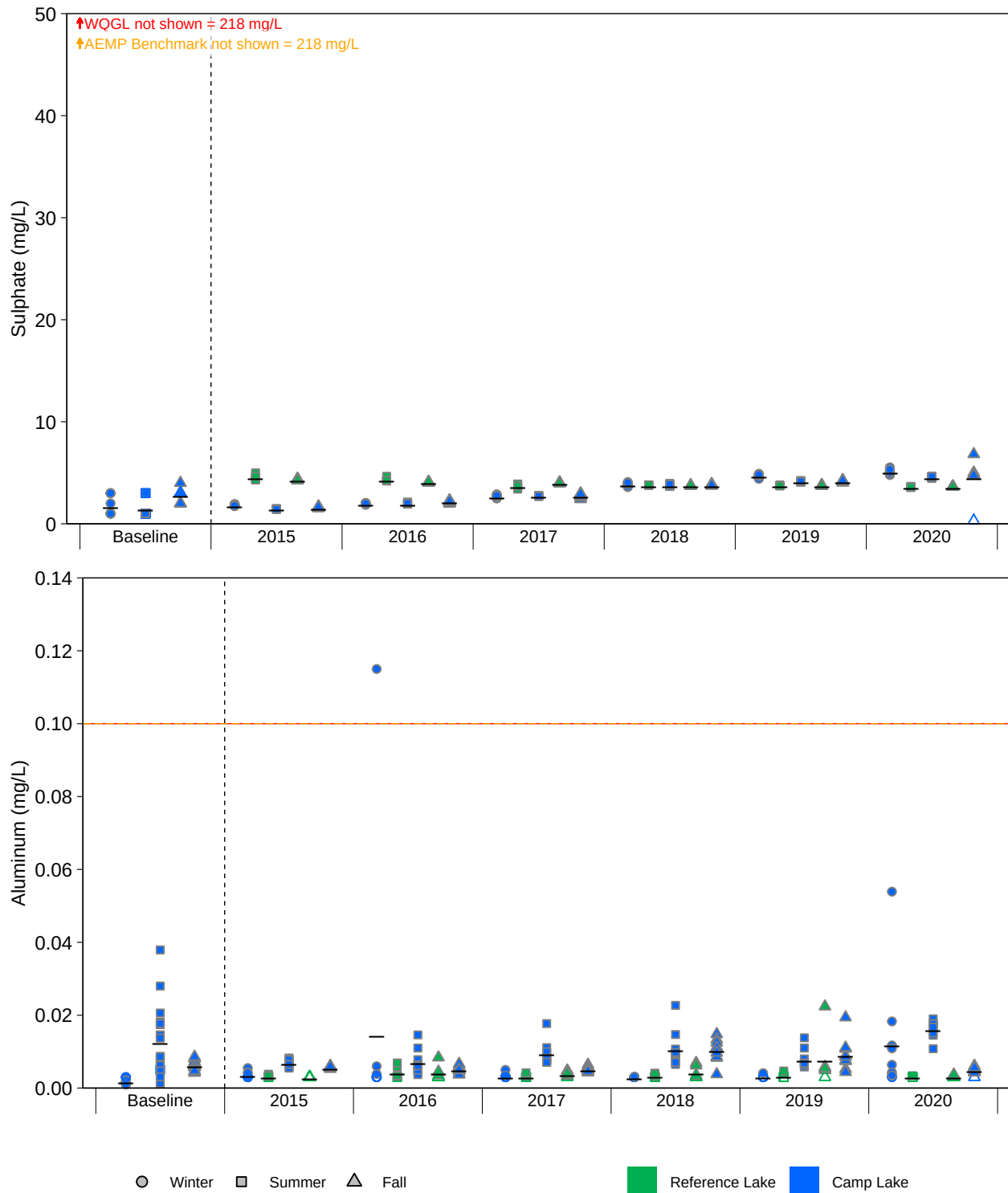


**Figure C.9: Temporal Comparison of Water Chemistry at Camp Lake (JLO) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

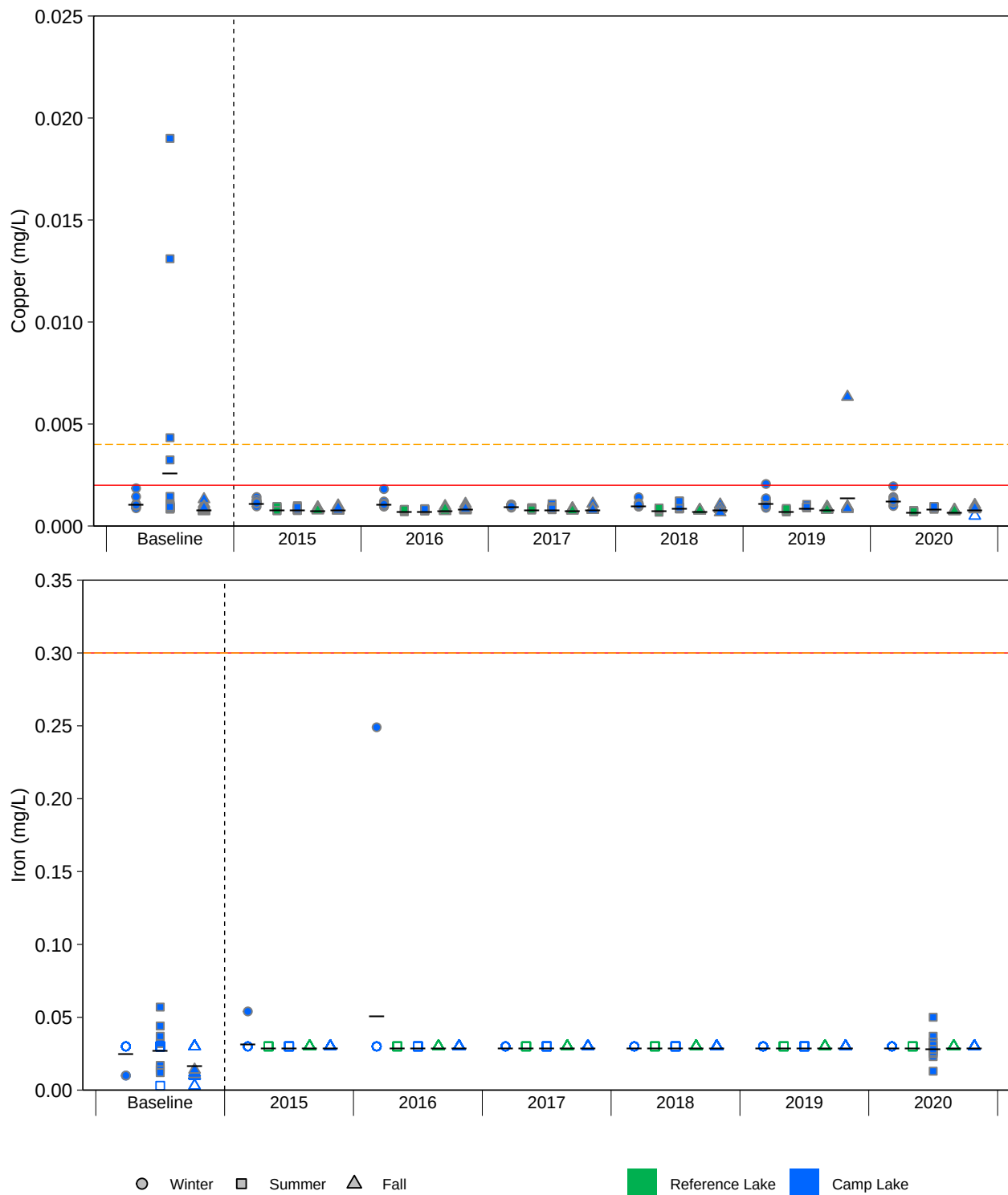


**Figure C.9: Temporal Comparison of Water Chemistry at Camp Lake (JLO) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

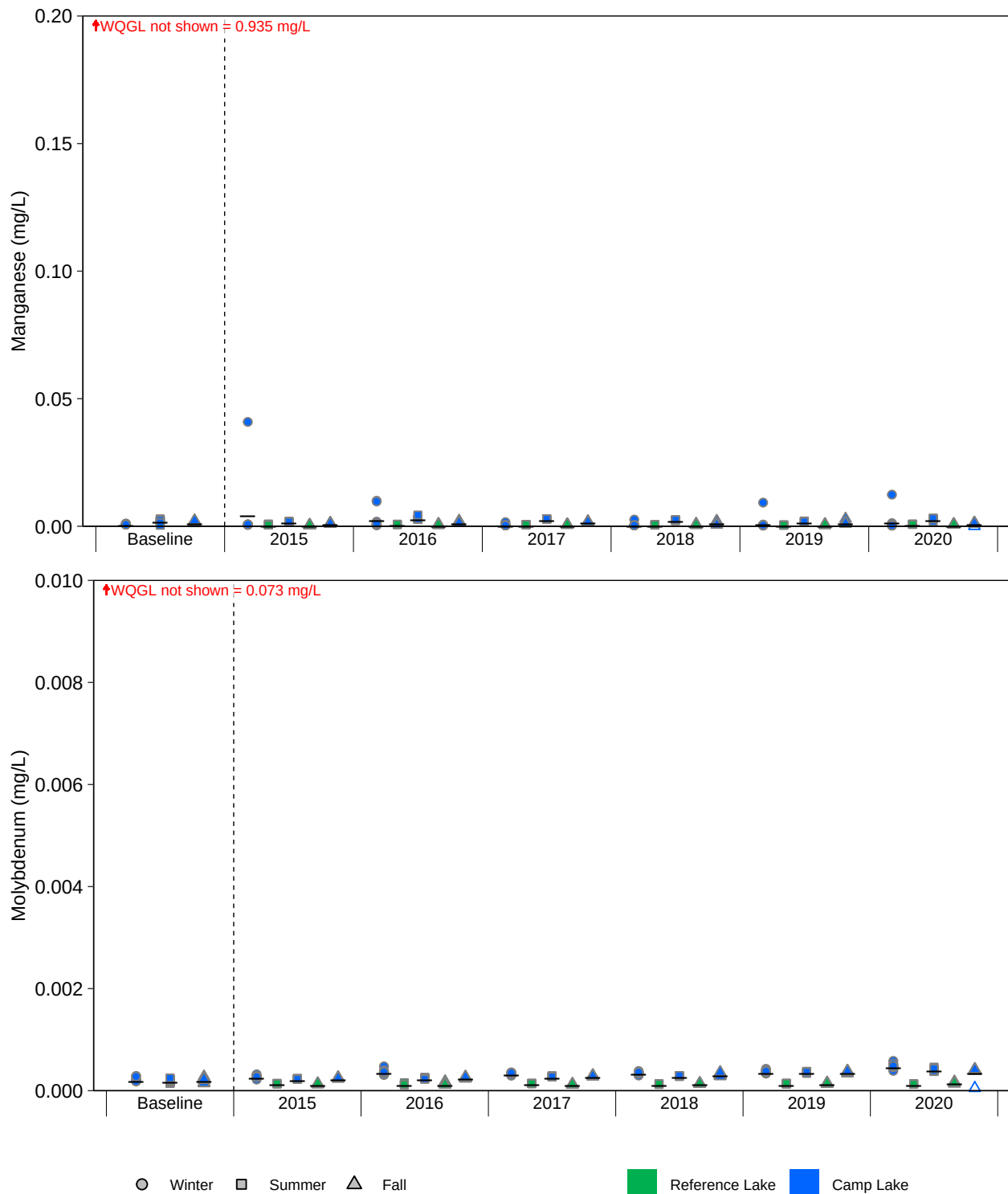


**Figure C.9: Temporal Comparison of Water Chemistry at Camp Lake (JLO) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

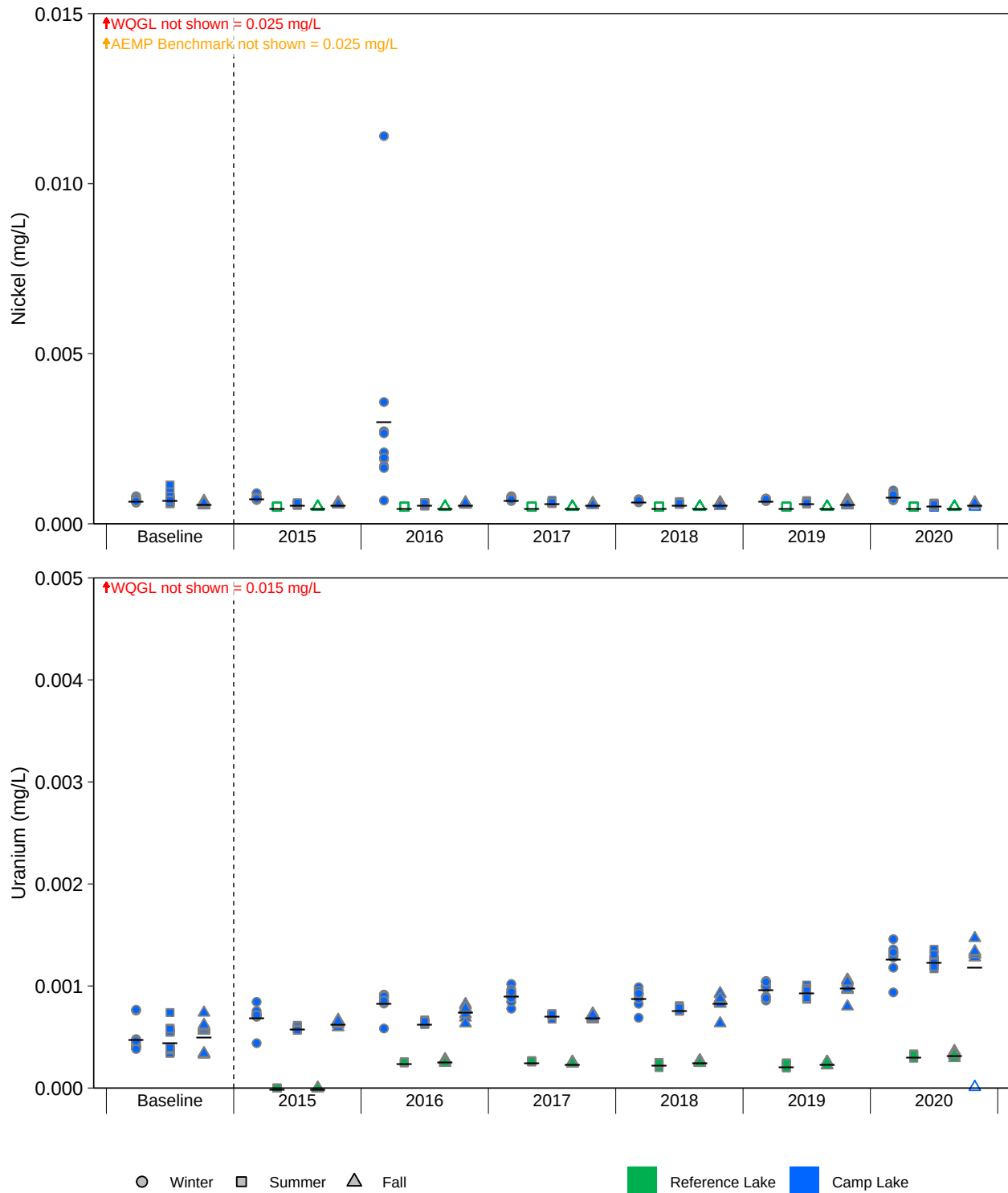


**Figure C.9: Temporal Comparison of Water Chemistry at Camp Lake (JLO) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

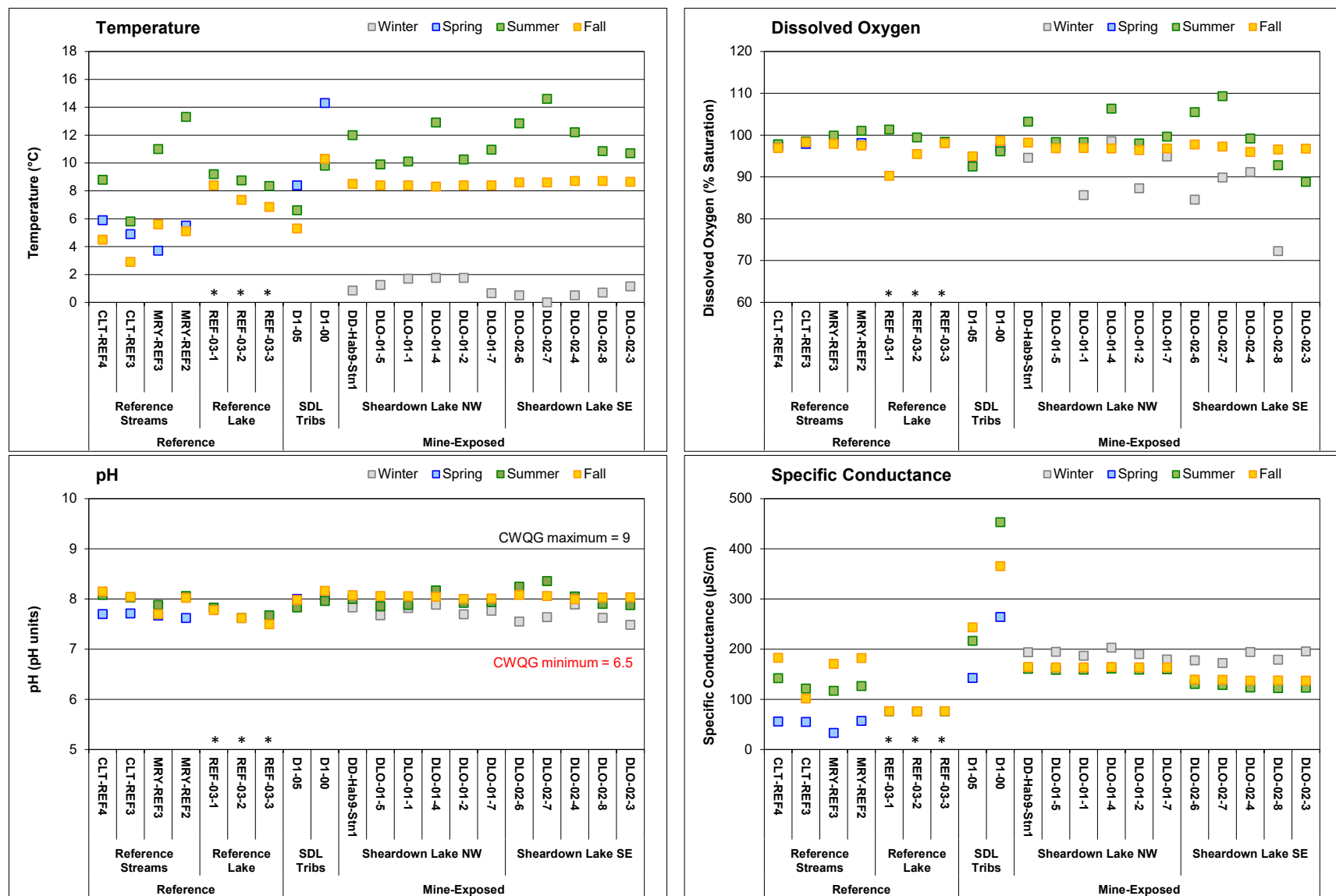


**Figure C.10: Comparison of *In Situ* Water Quality Variables Measured at Sheardown Lake System Water Quality Monitoring Stations in Winter, Spring, Summer, and Fall 2020, Mary River Project CREMP**

Notes: Lake values represent mean of surface and bottom *in situ* water quality measurements. Streams were not sampled in winter. Lakes were not sampled in spring.

\* Reference Lake 3 (REF-03) was not sampled in winter.

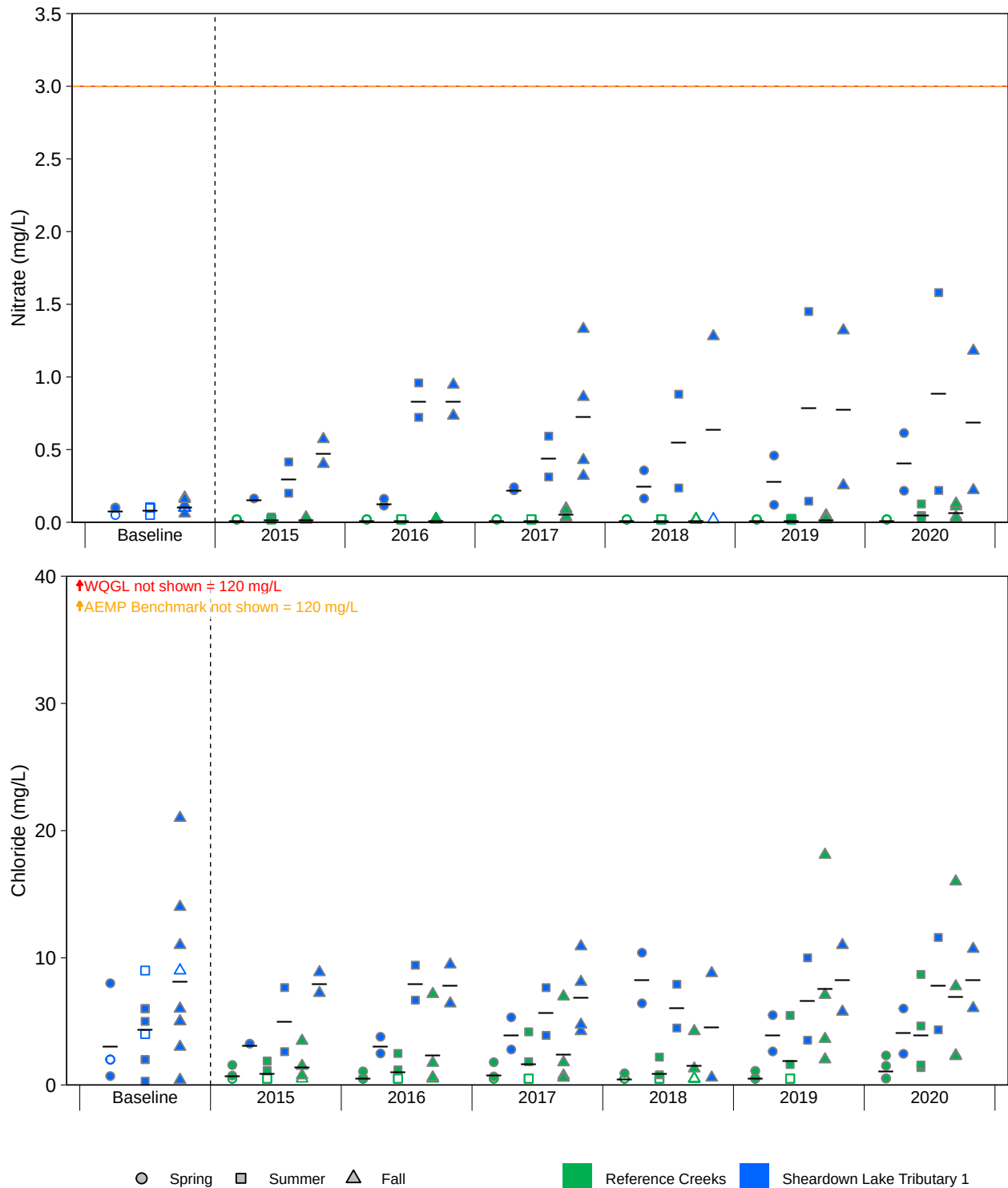


**Figure C.11: Temporal Comparison of Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

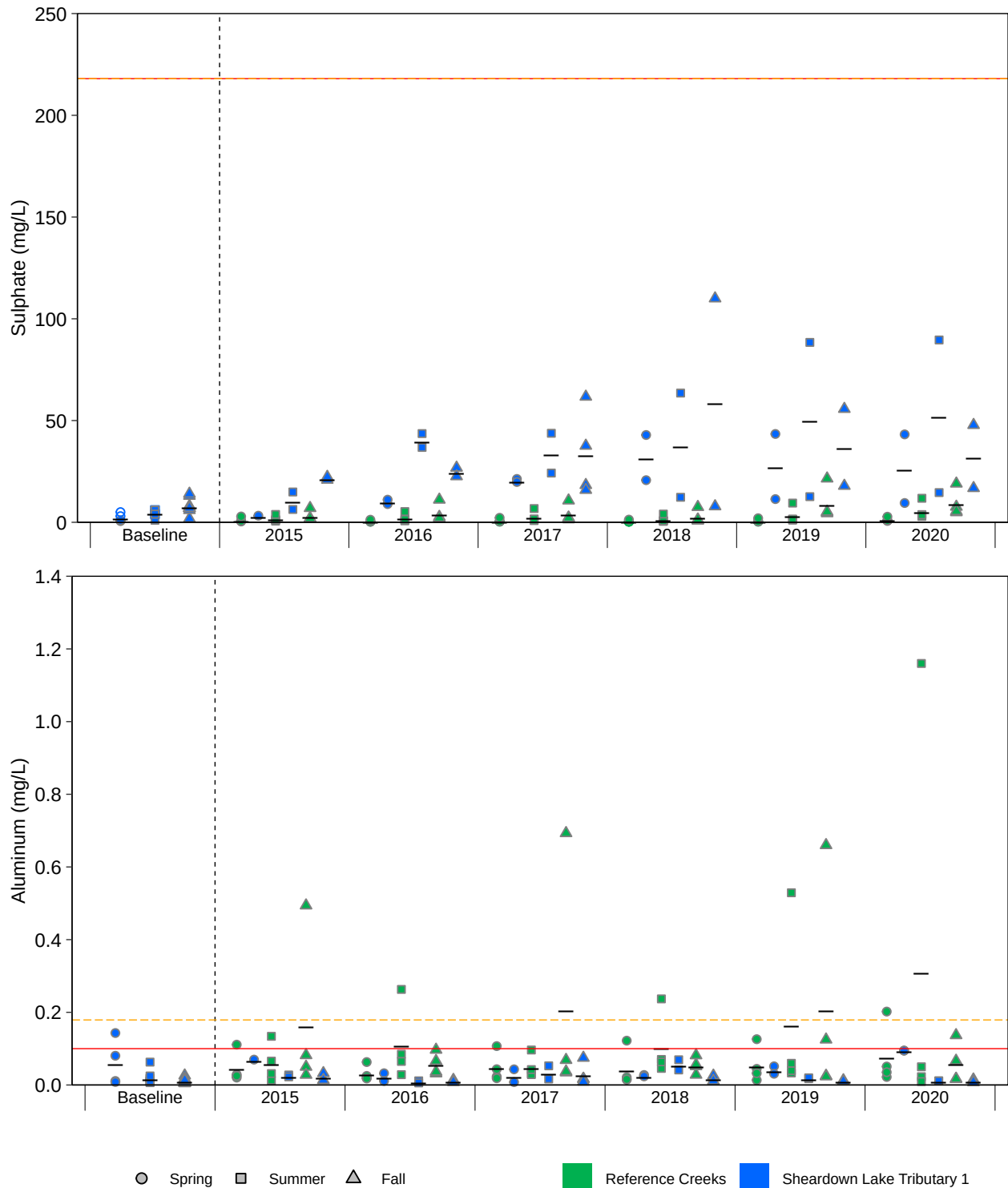


**Figure C.11: Temporal Comparison of Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.



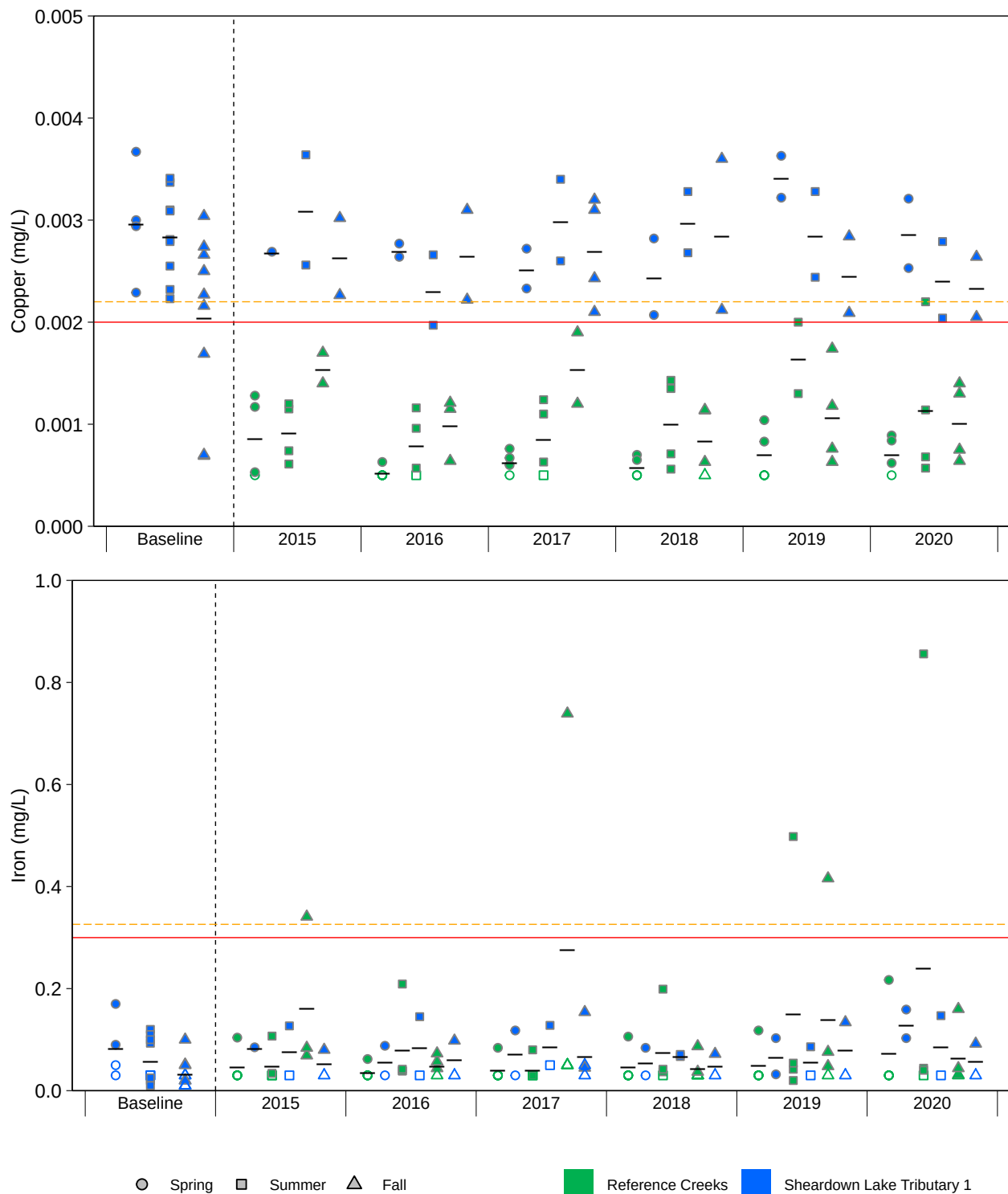


**Figure C.11: Temporal Comparison of Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

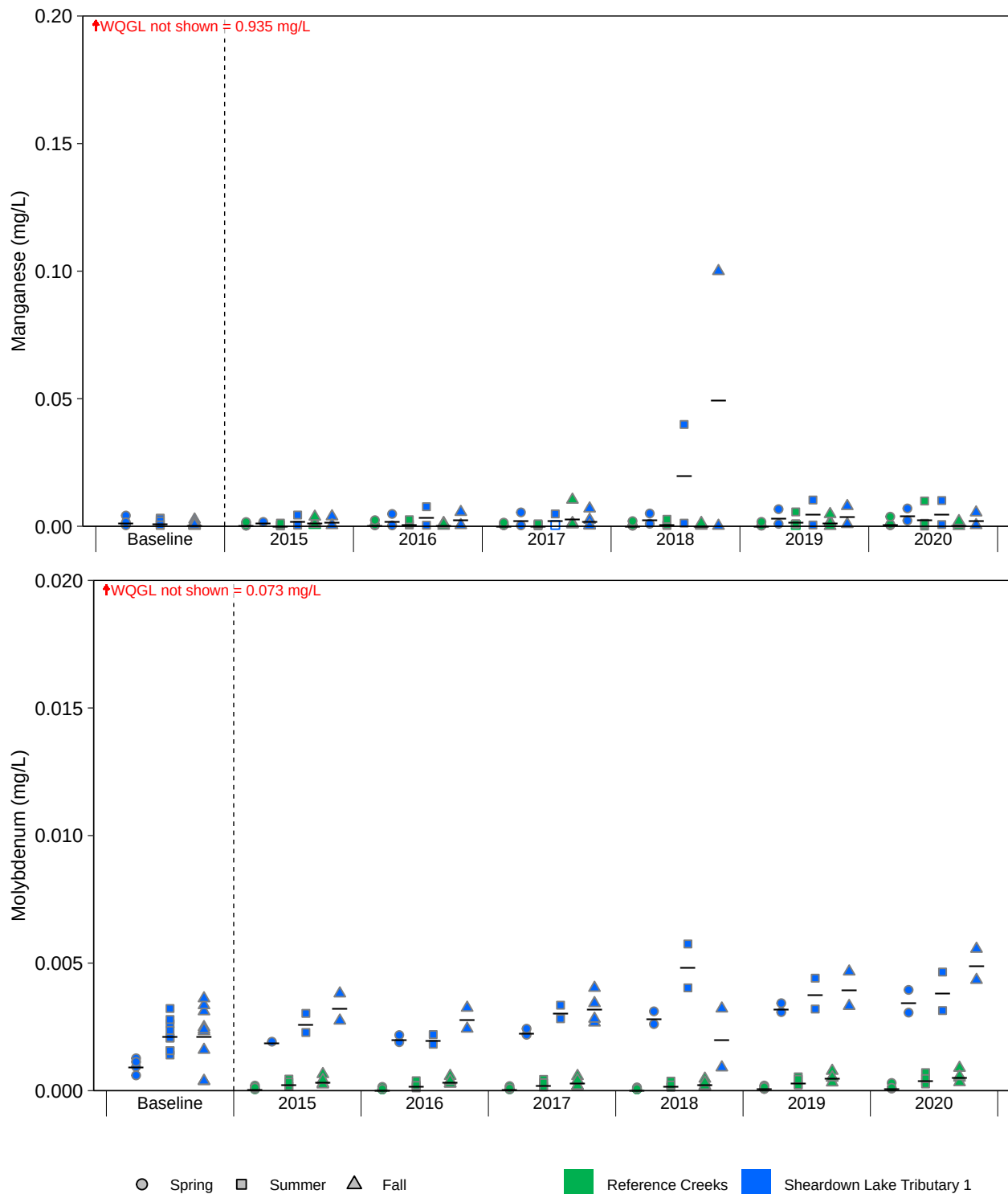


**Figure C.11: Temporal Comparison of Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

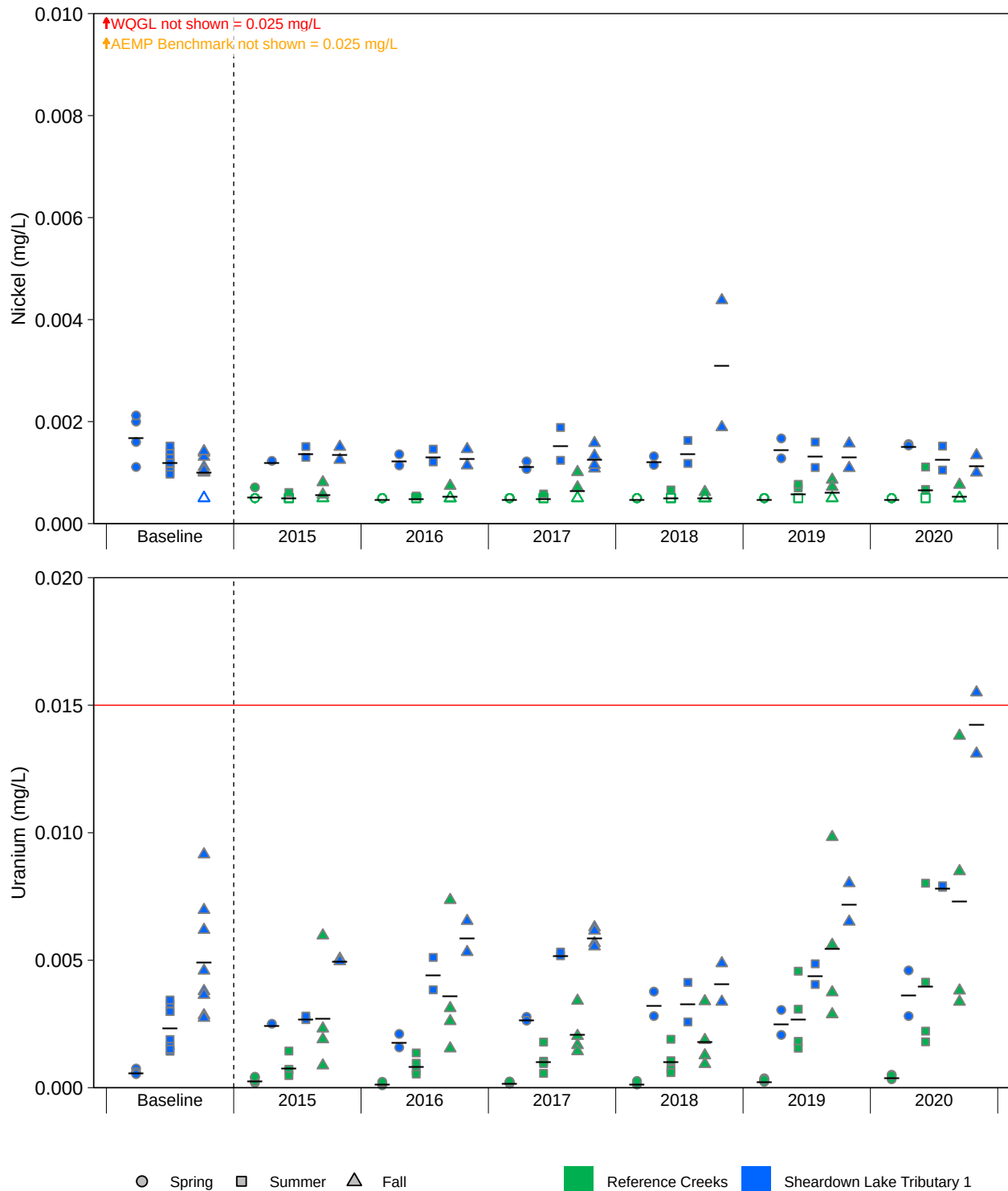


**Figure C.11: Temporal Comparison of Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

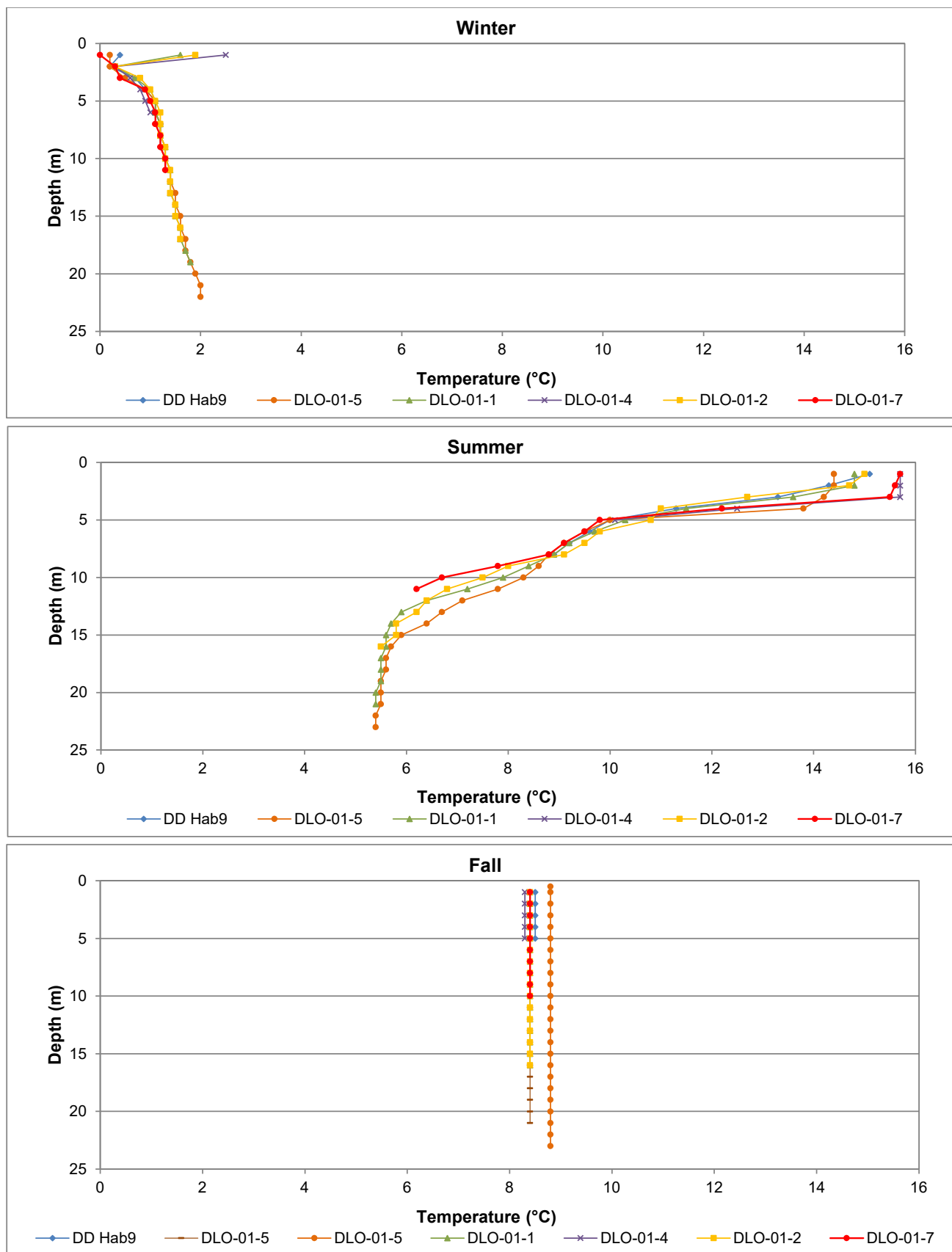


**Figure C.12:** Vertical Profiles of Temperature Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2020

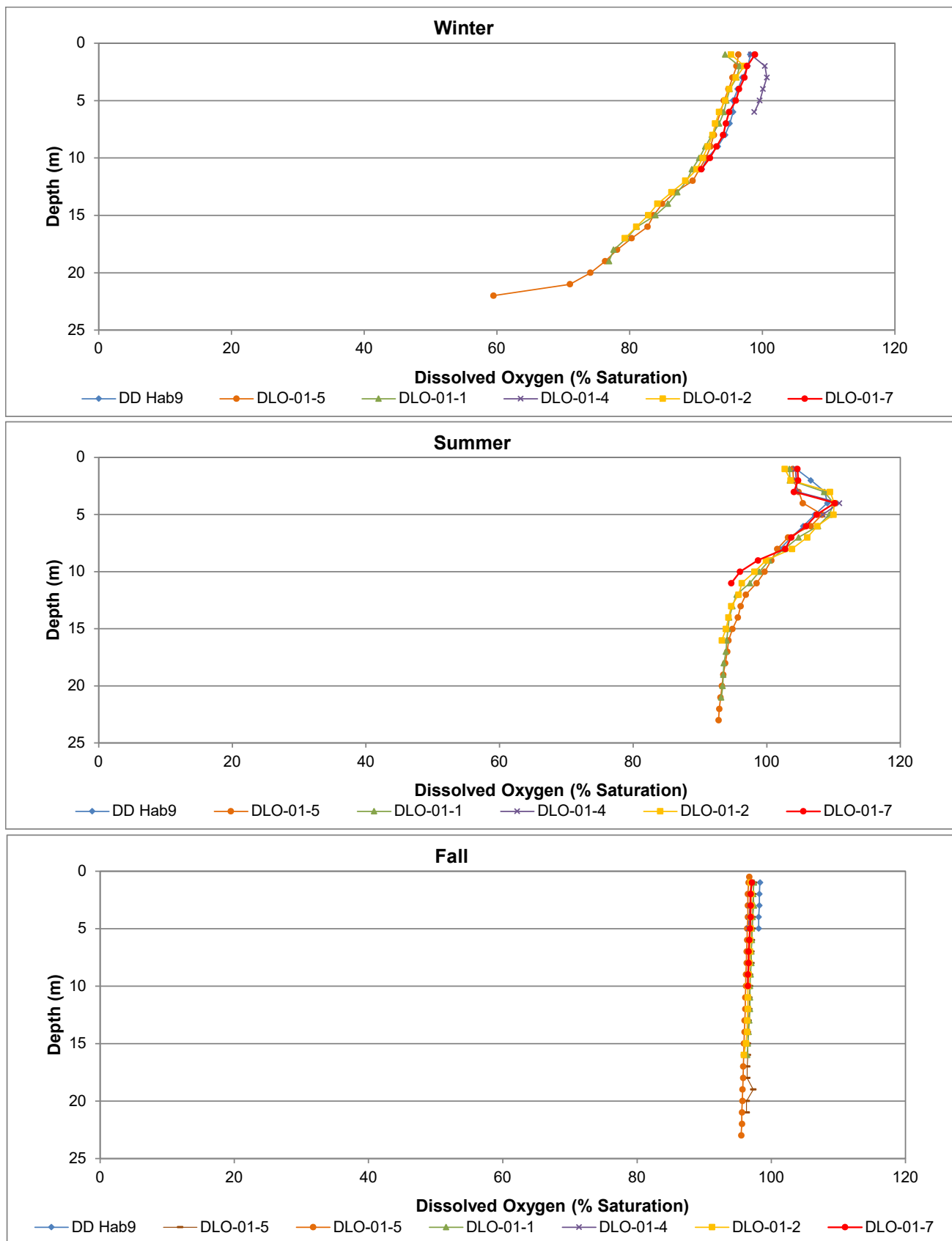


**Figure C.13:** Vertical Profiles of Dissolved Oxygen Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2020

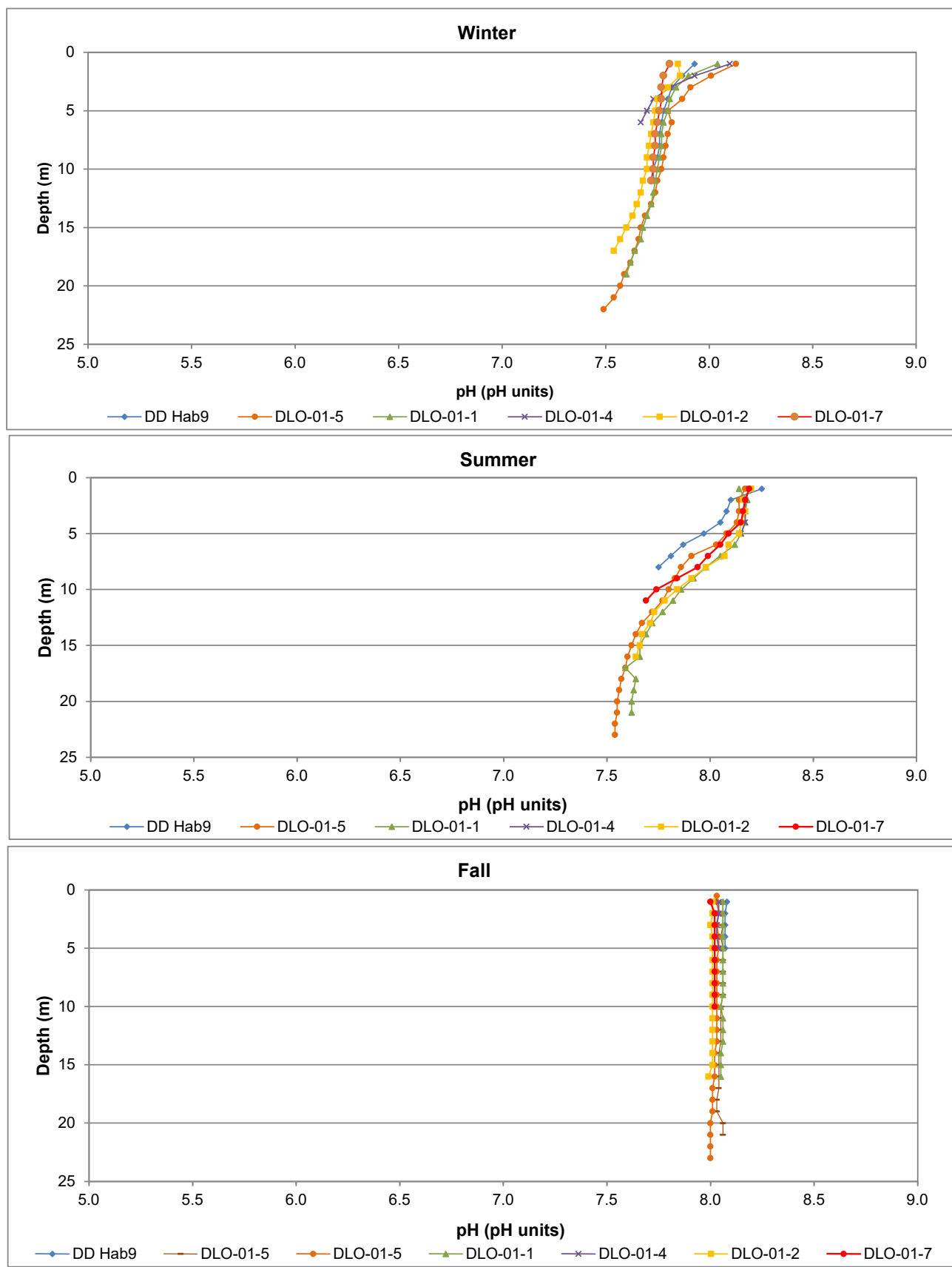


**Figure C.14:** Vertical Profiles of pH Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2020

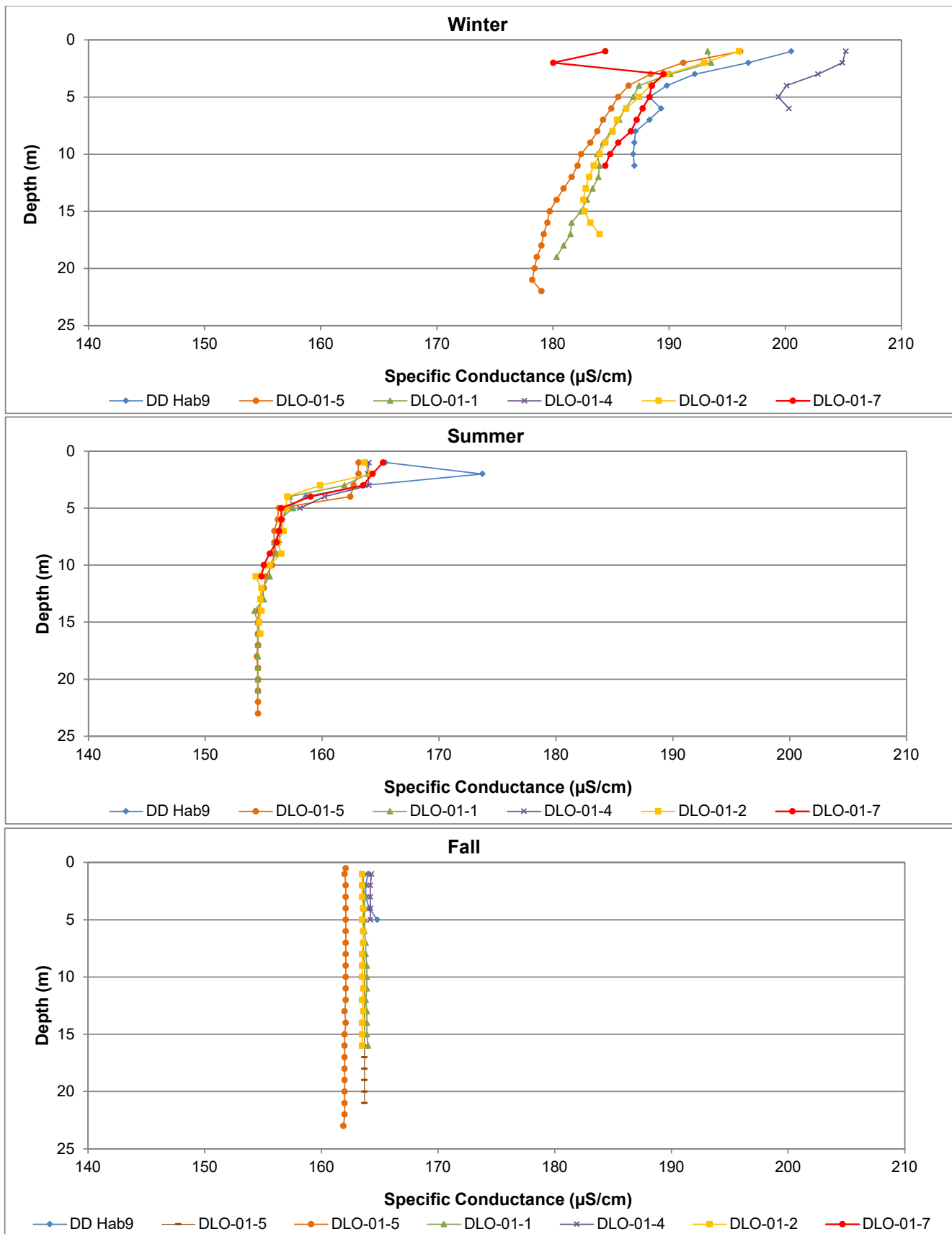


**Figure C.15:** Vertical Profiles of Specific Conductance Measured at Sheardown Lake NW in Winter, Summer, and Fall, 2020

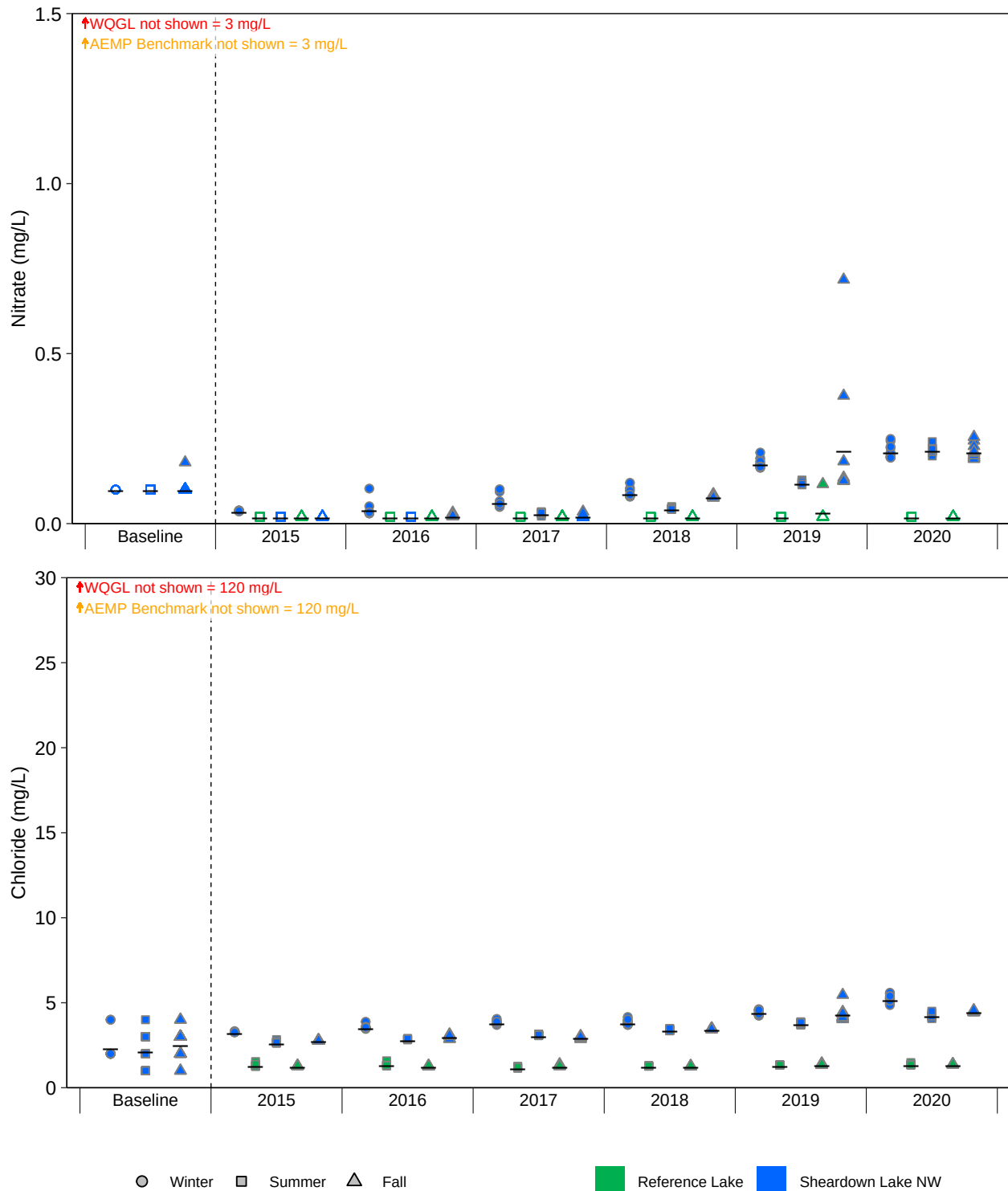


**Figure C.16: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DL0-01) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.



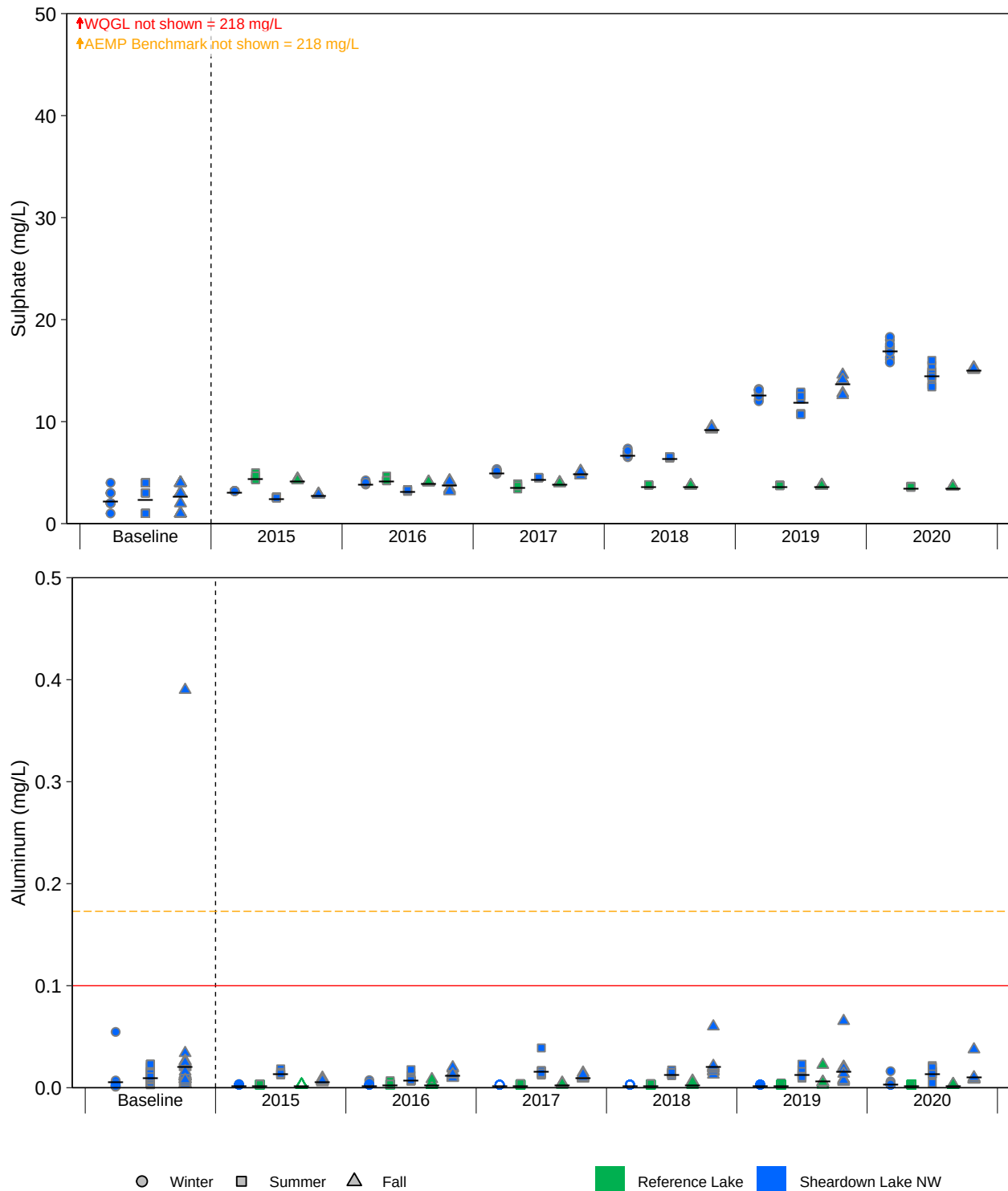


**Figure C.16: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DL0-01) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

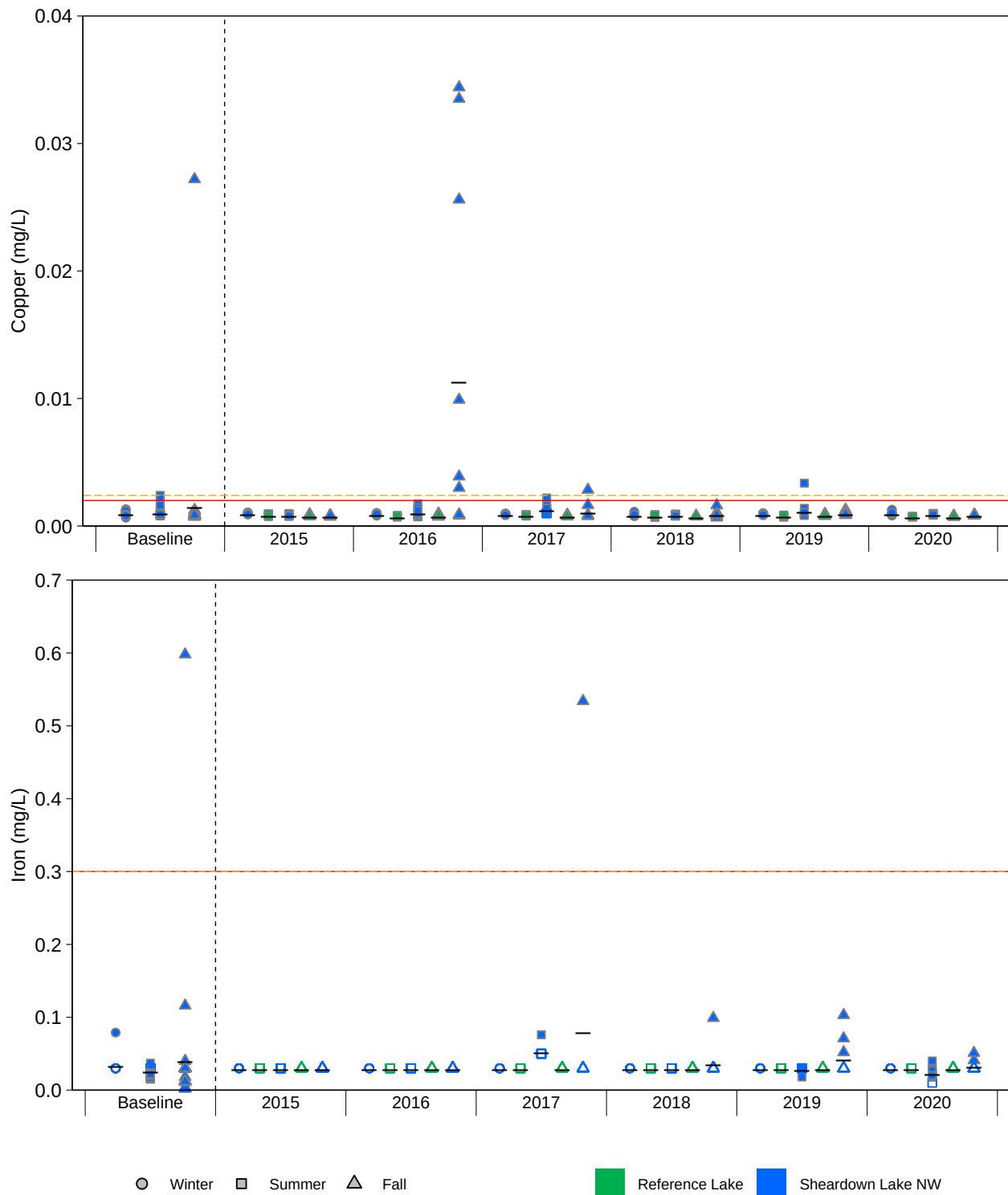


**Figure C.16: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DL0-01) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

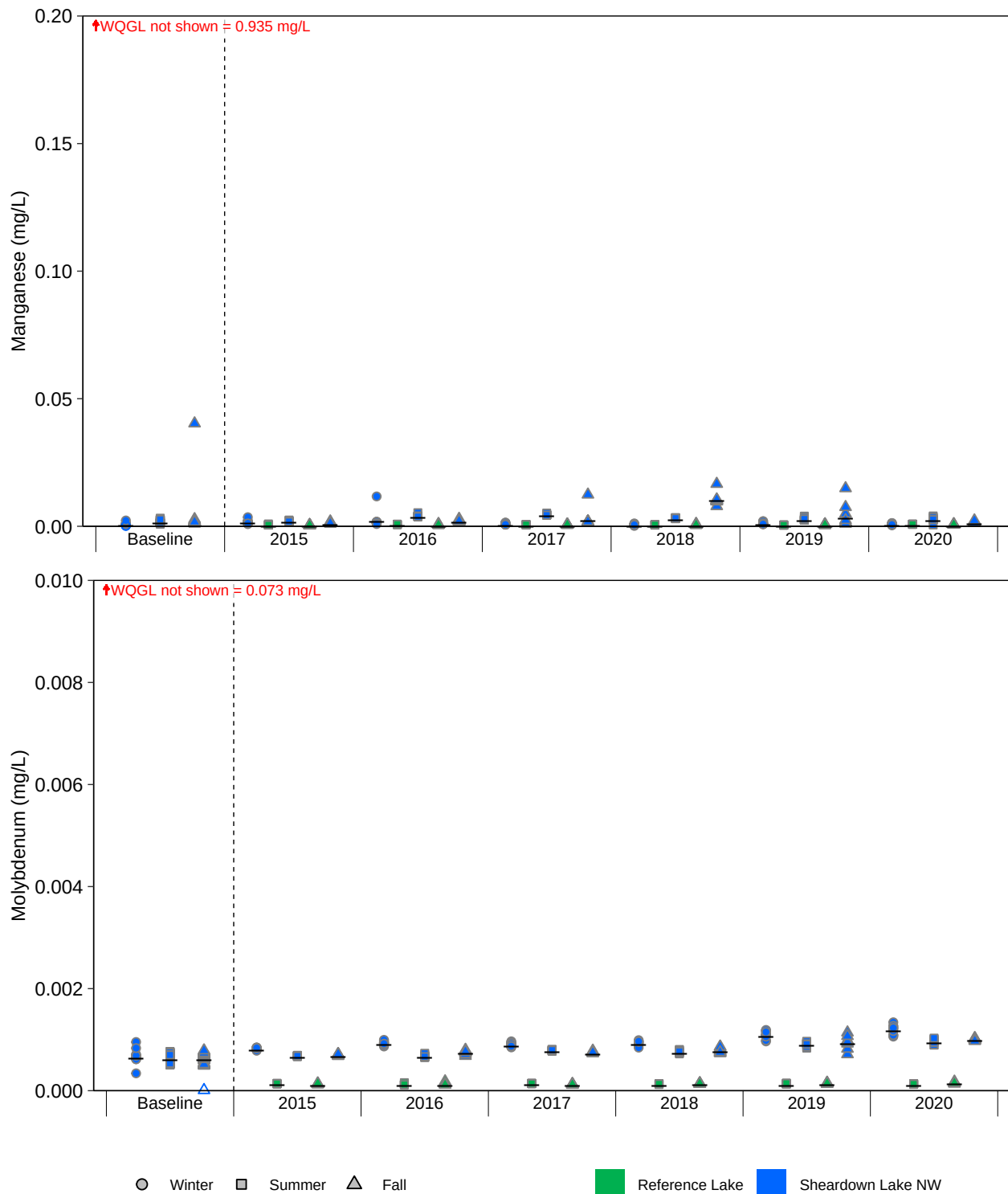


**Figure C.16: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DL0-01) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

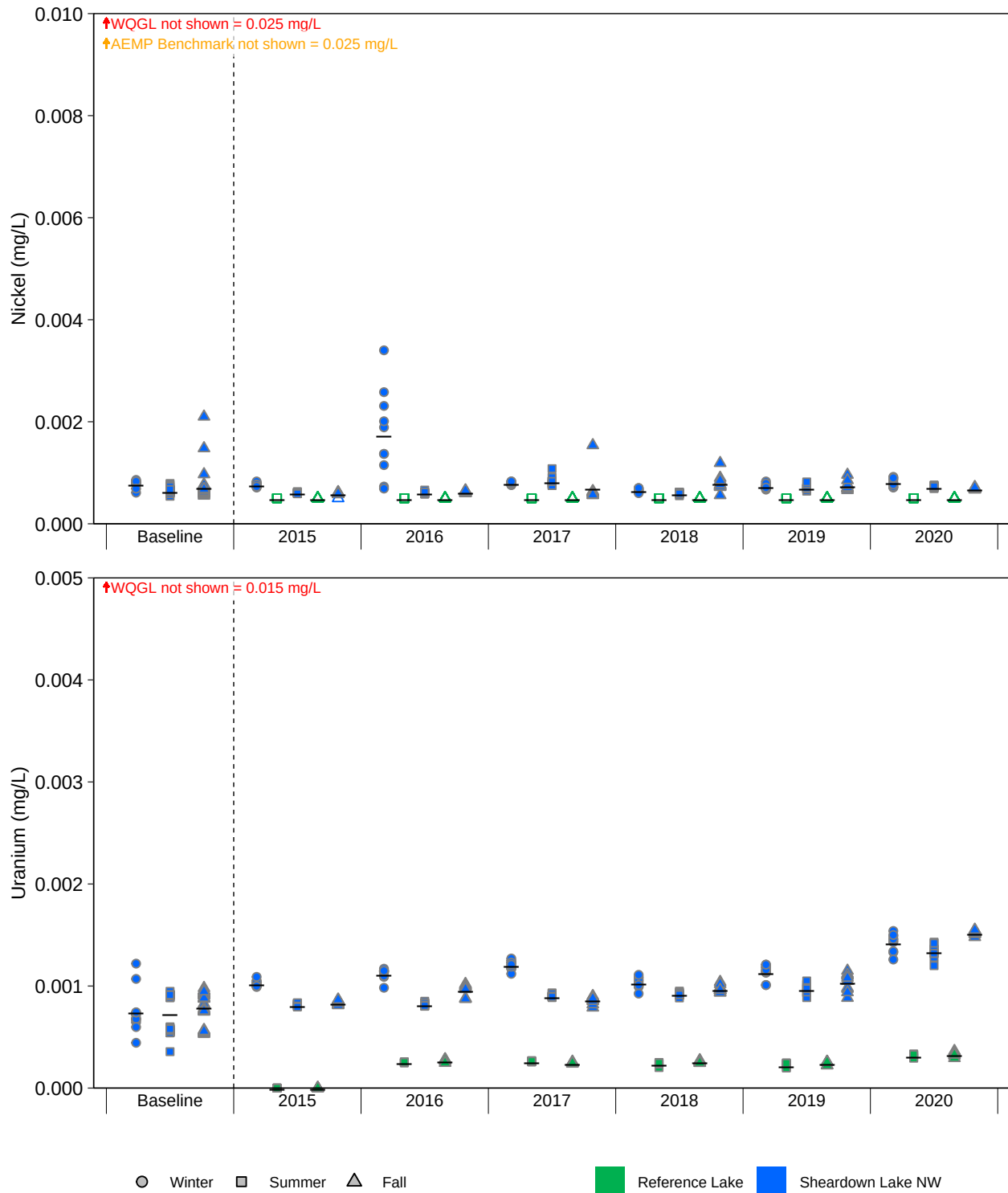


**Figure C.16: Temporal Comparison of Water Chemistry at Sheardown Lake Northwest (DL0-01) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

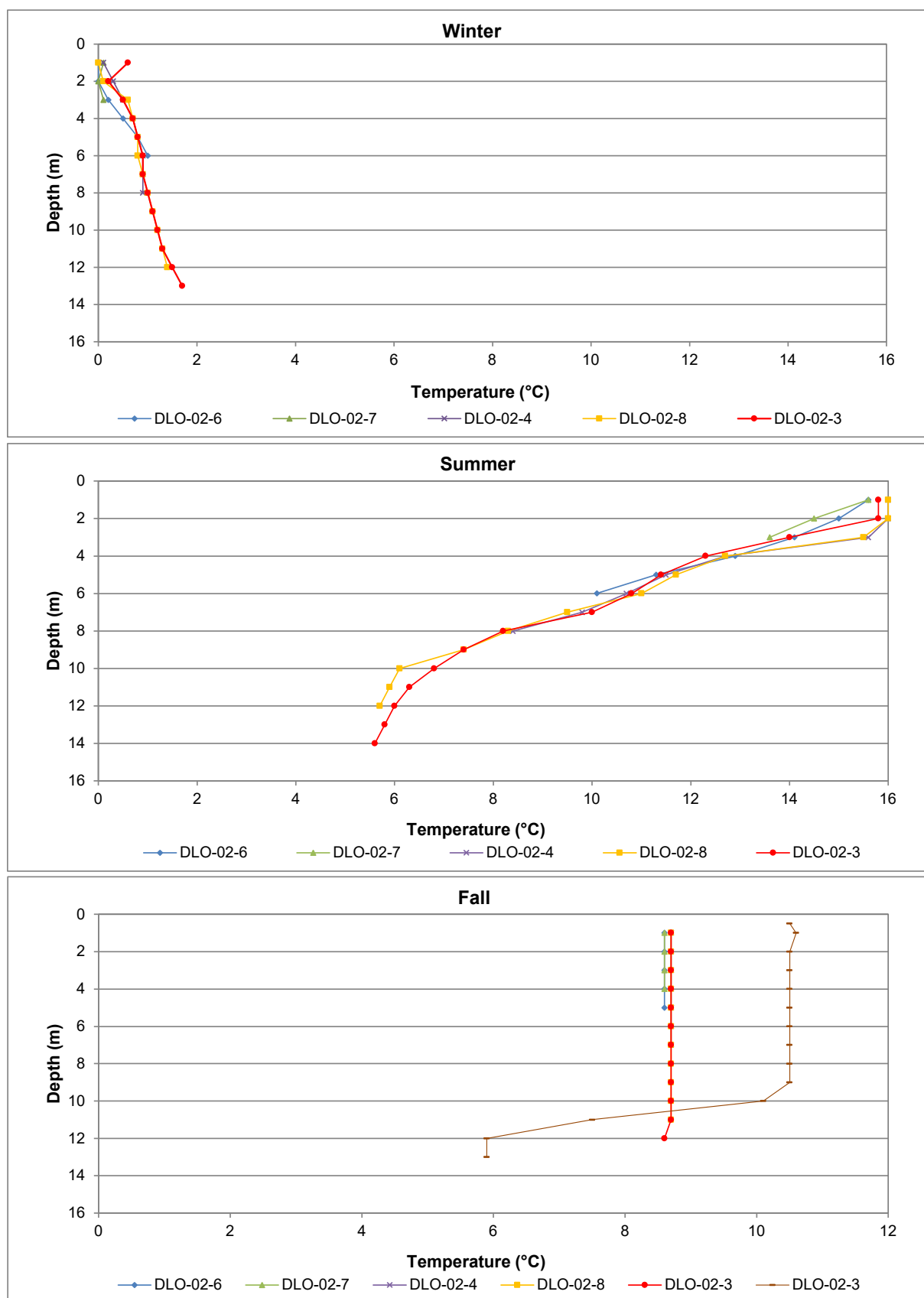


**Figure C.17: Vertical Profiles of Temperature Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2020**

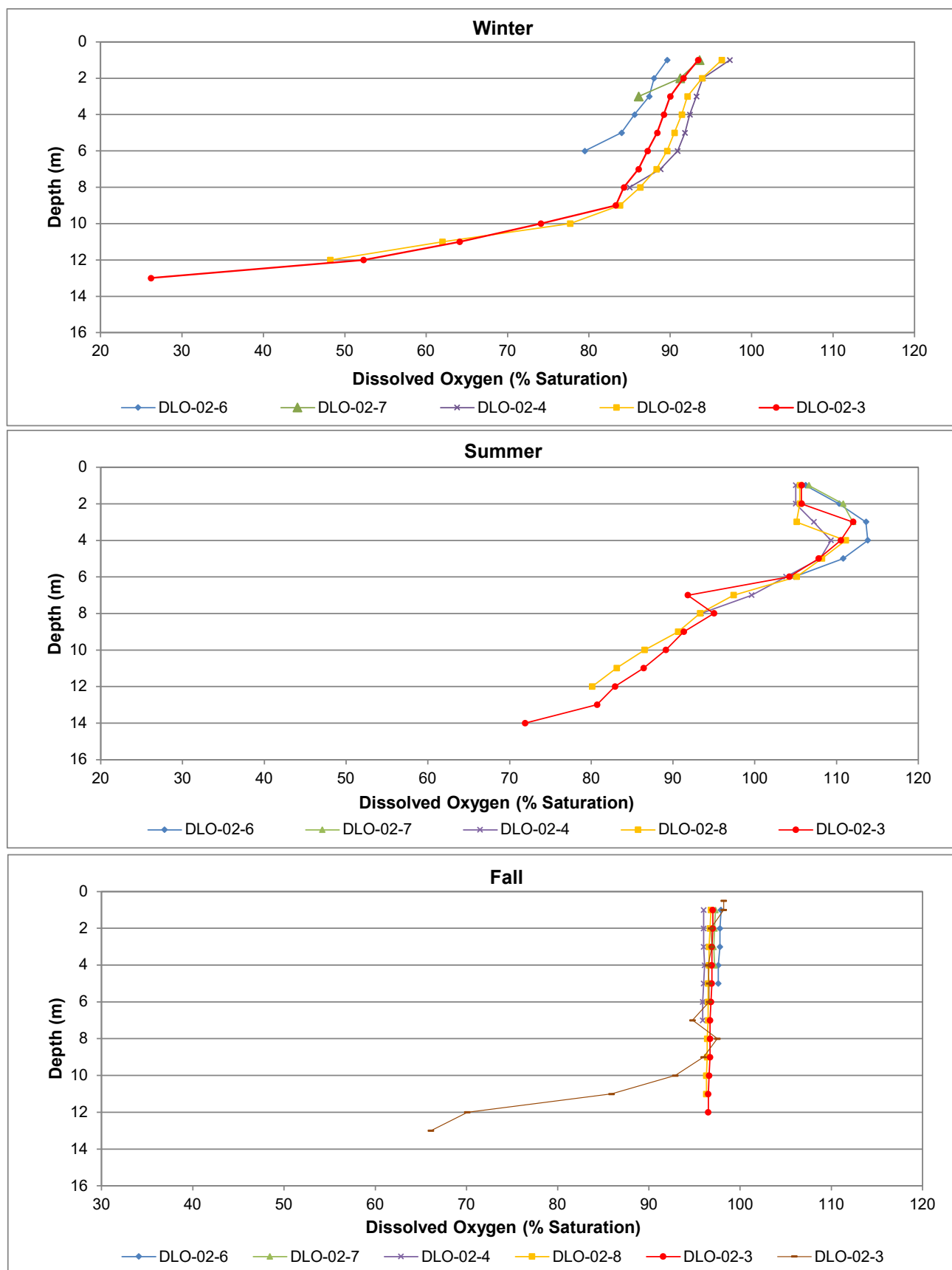


**Figure C.18: Vertical Profiles of Dissolved Oxygen Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2020**

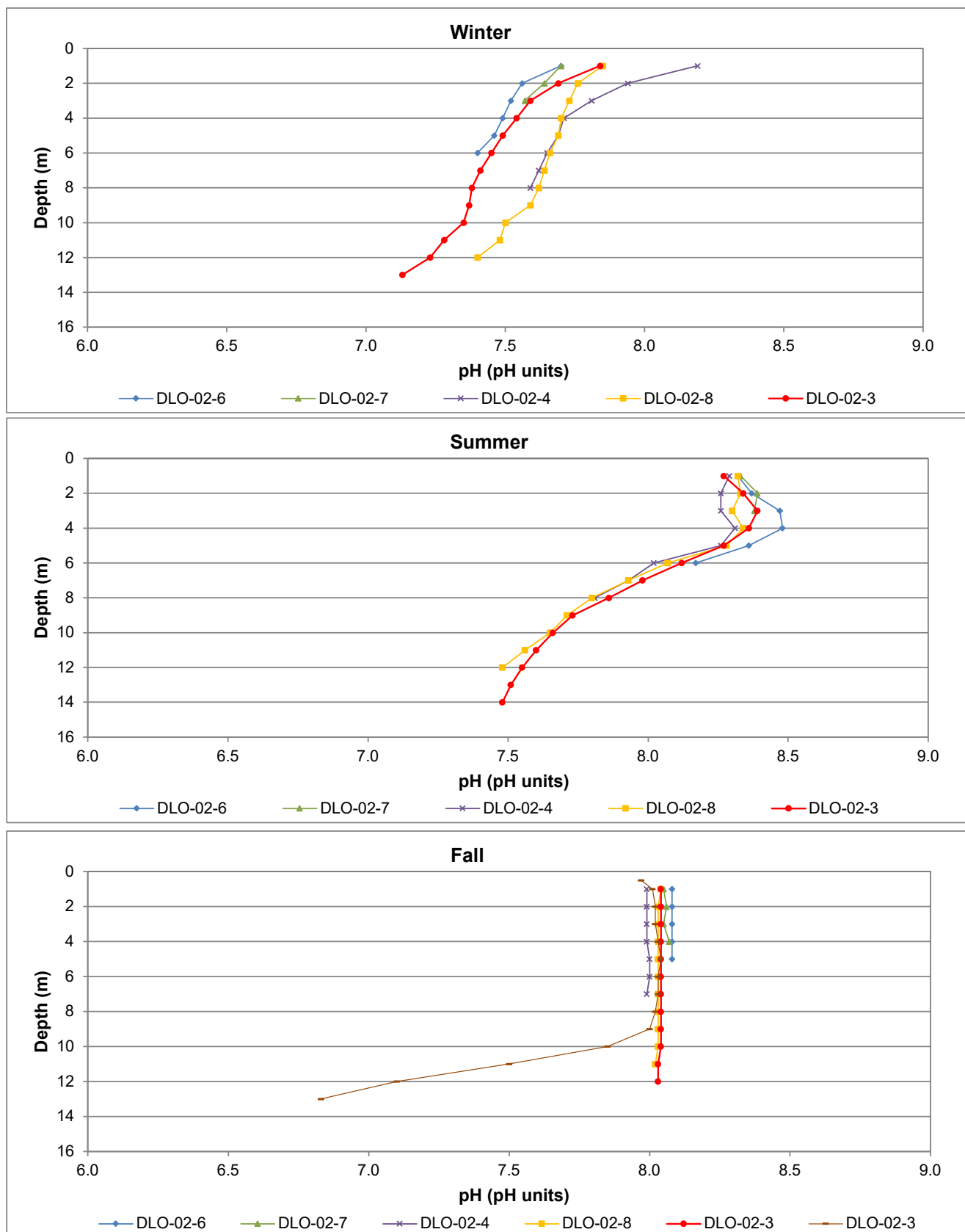


**Figure C.19: Vertical Profiles of pH Measured at Sheardown Lake SE in Winter, Summer, and Fall, 2020**

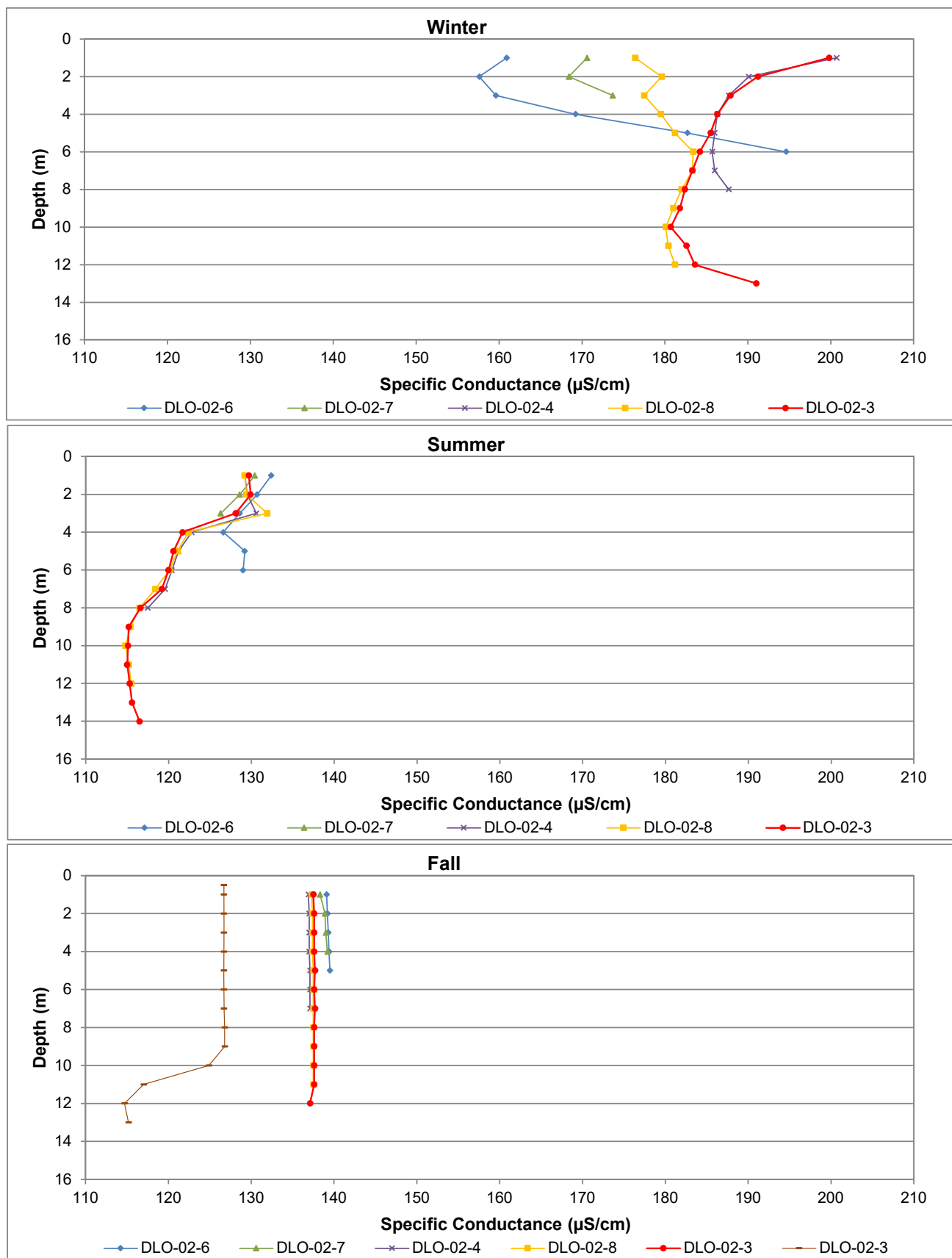


**Figure C.20: Vertical Profiles of Conductivity Measured at Sheardown Lake SE in Winter, Summer, and Fall 2020**



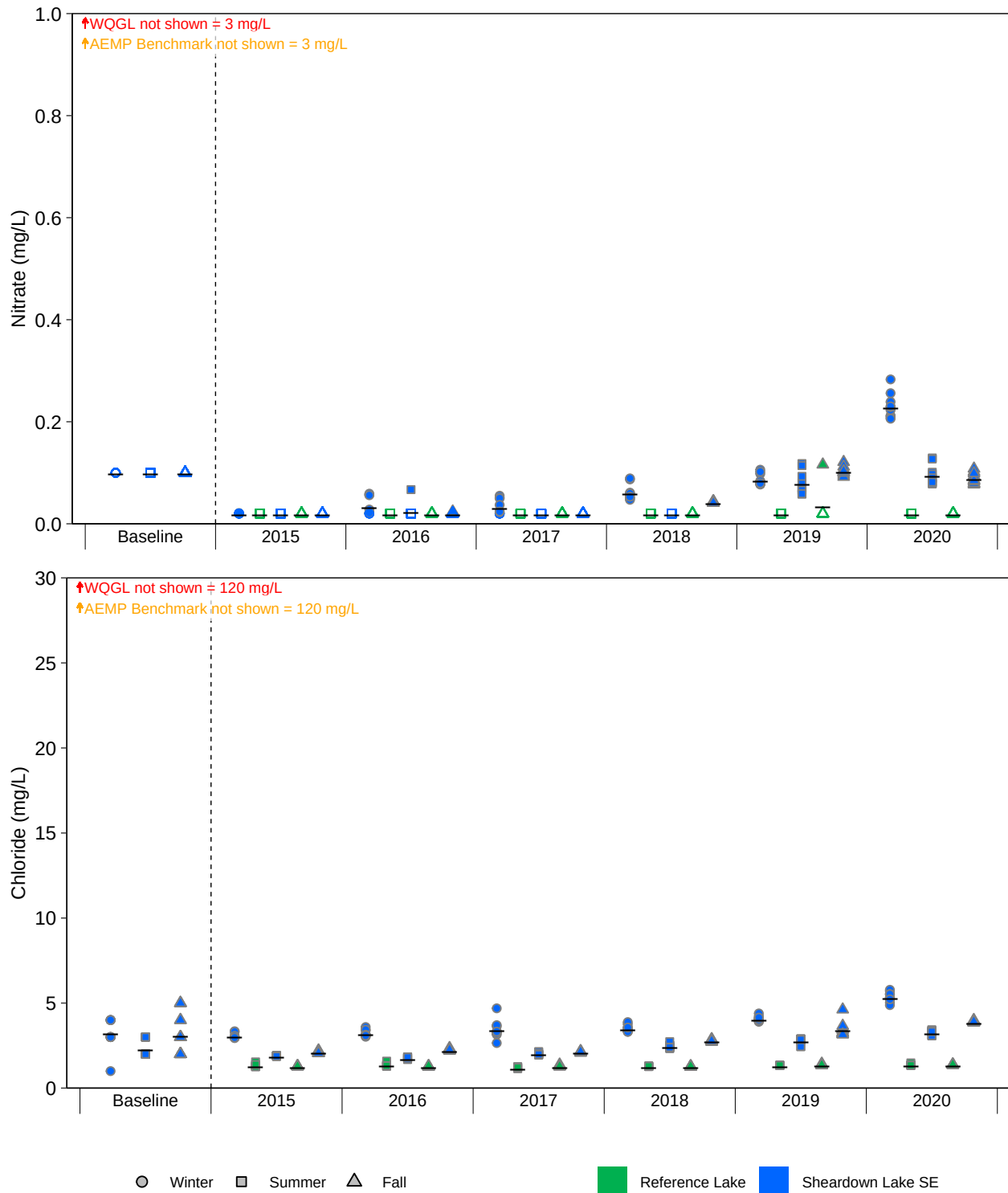


**Figure C.21: Temporal Comparison of Water Chemistry at Sheardown Lake Southeast (DL0-02) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

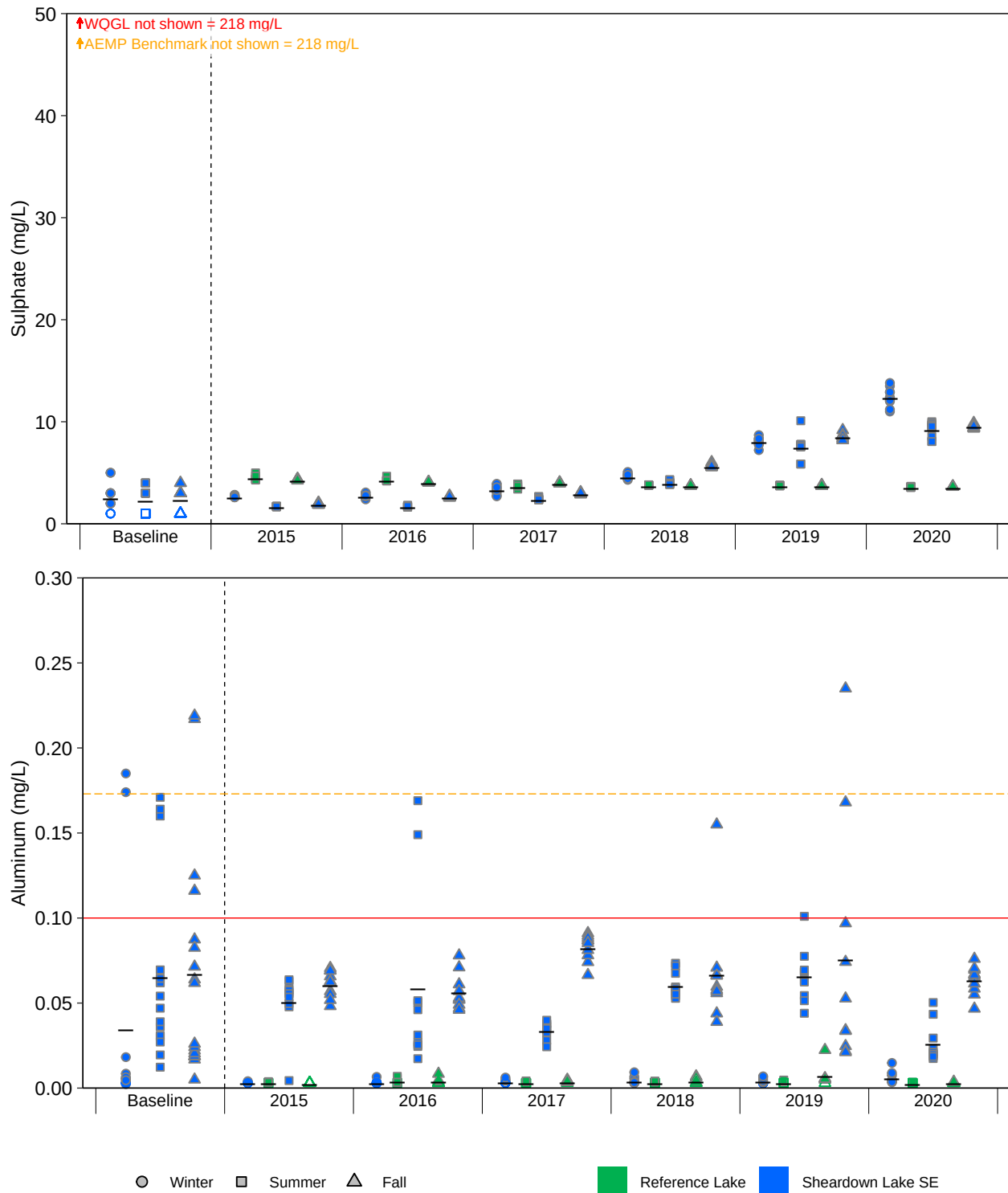


**Figure C.21: Temporal Comparison of Water Chemistry at Sheardown Lake Southeast (DL0-02) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

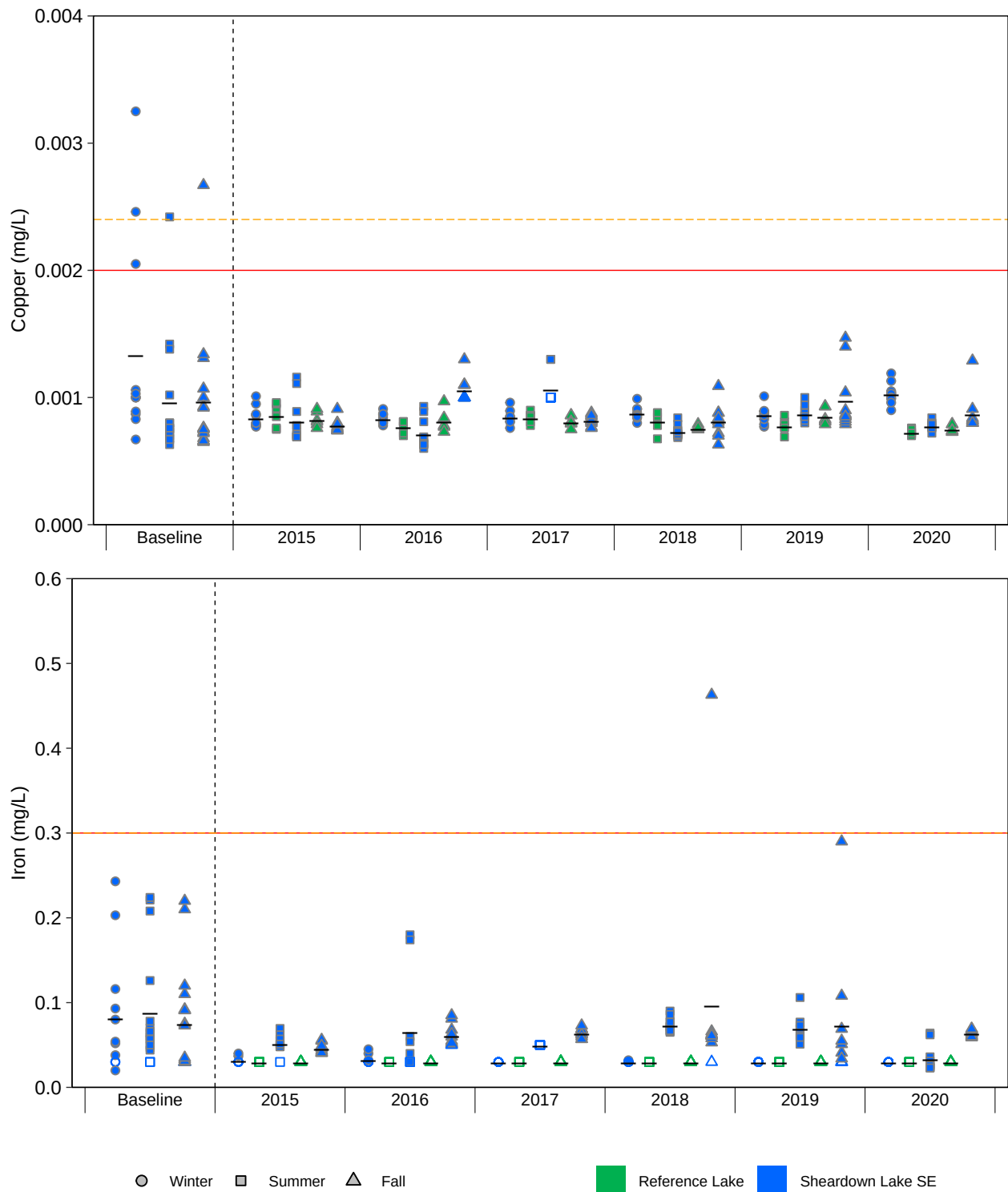


**Figure C.21: Temporal Comparison of Water Chemistry at Sheardown Lake Southeast (DL0-02) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

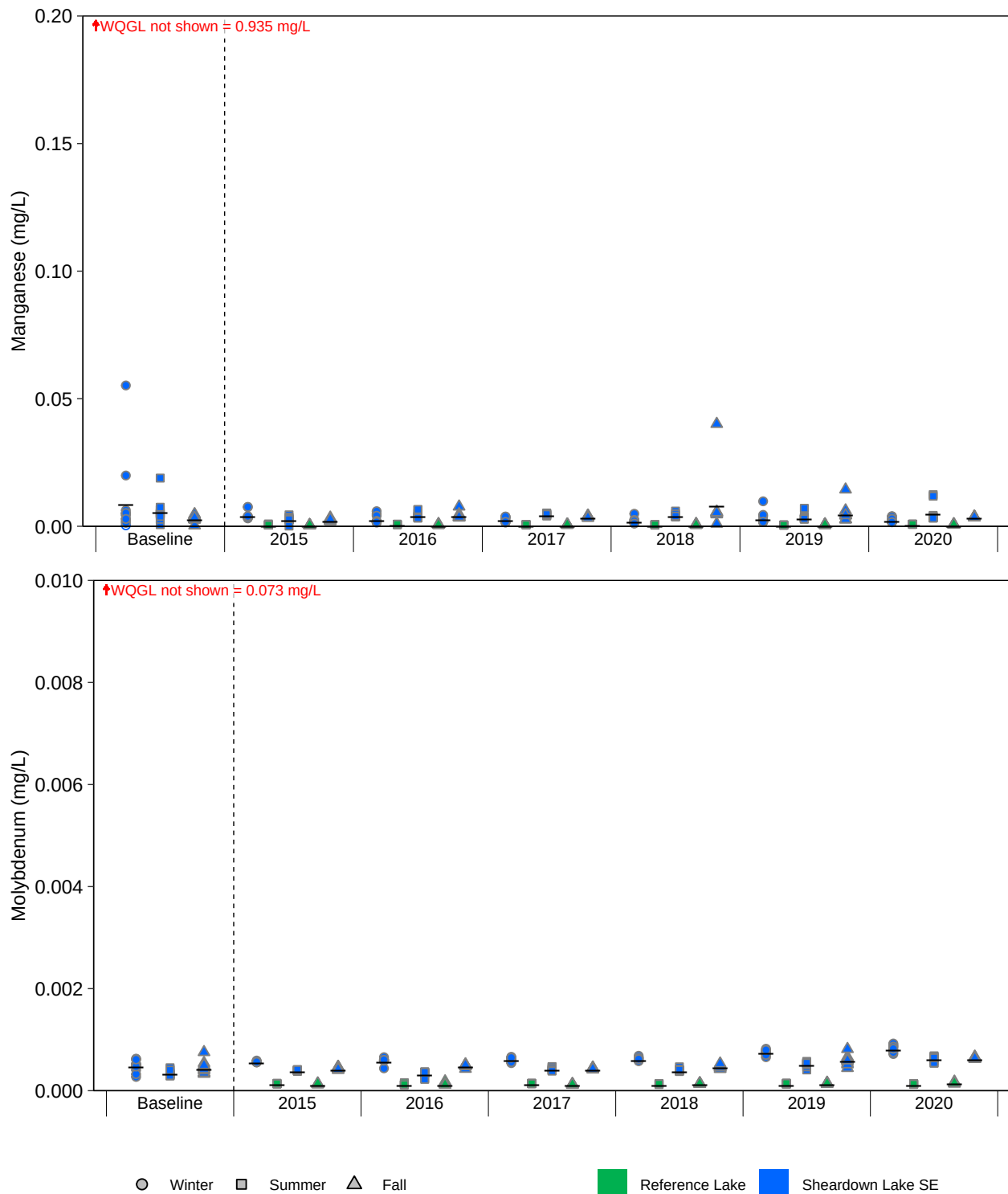


**Figure C.21: Temporal Comparison of Water Chemistry at Sheardown Lake Southeast (DL0-02) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

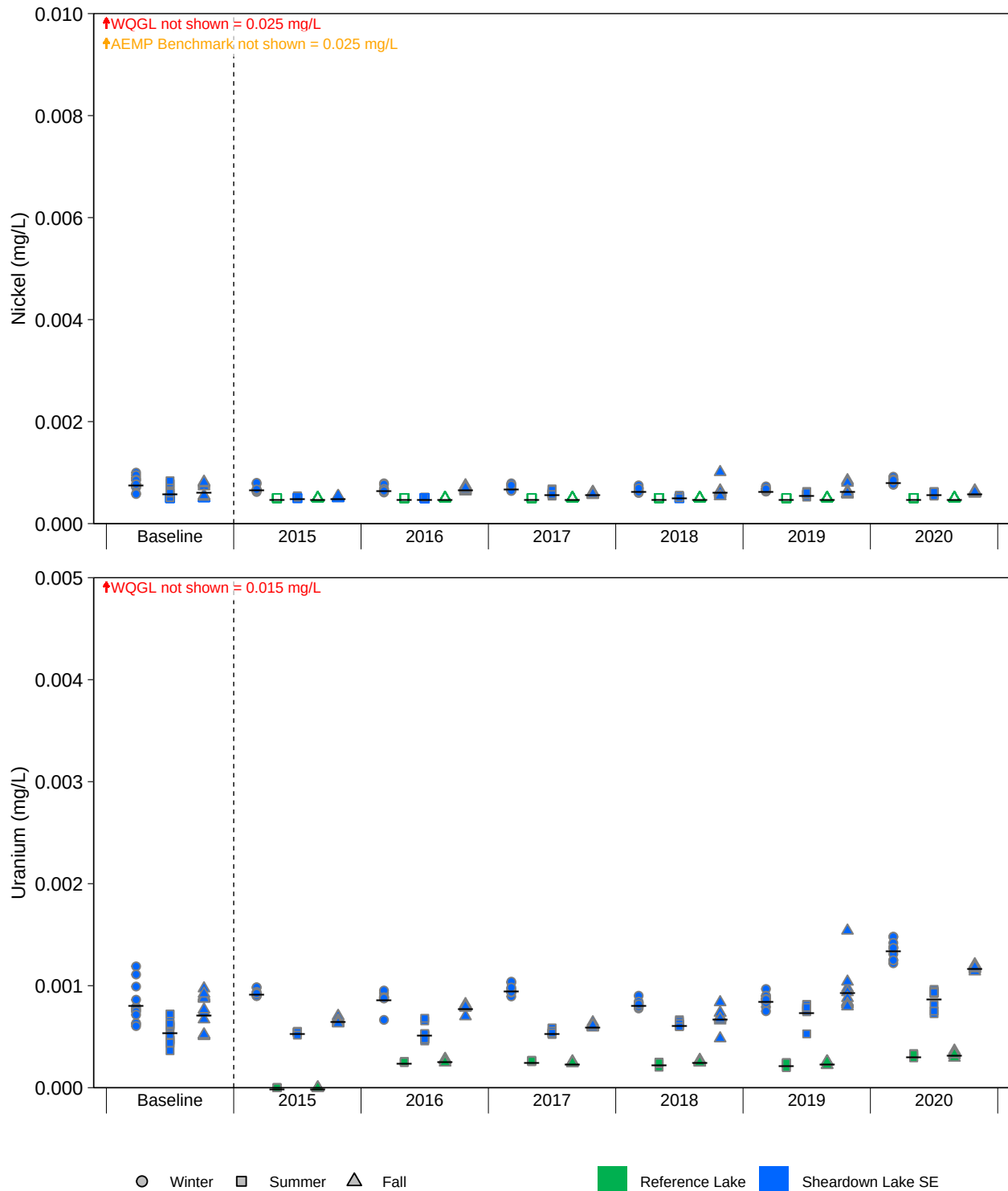


**Figure C.21: Temporal Comparison of Water Chemistry at Sheardown Lake Southeast (DL0-02) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

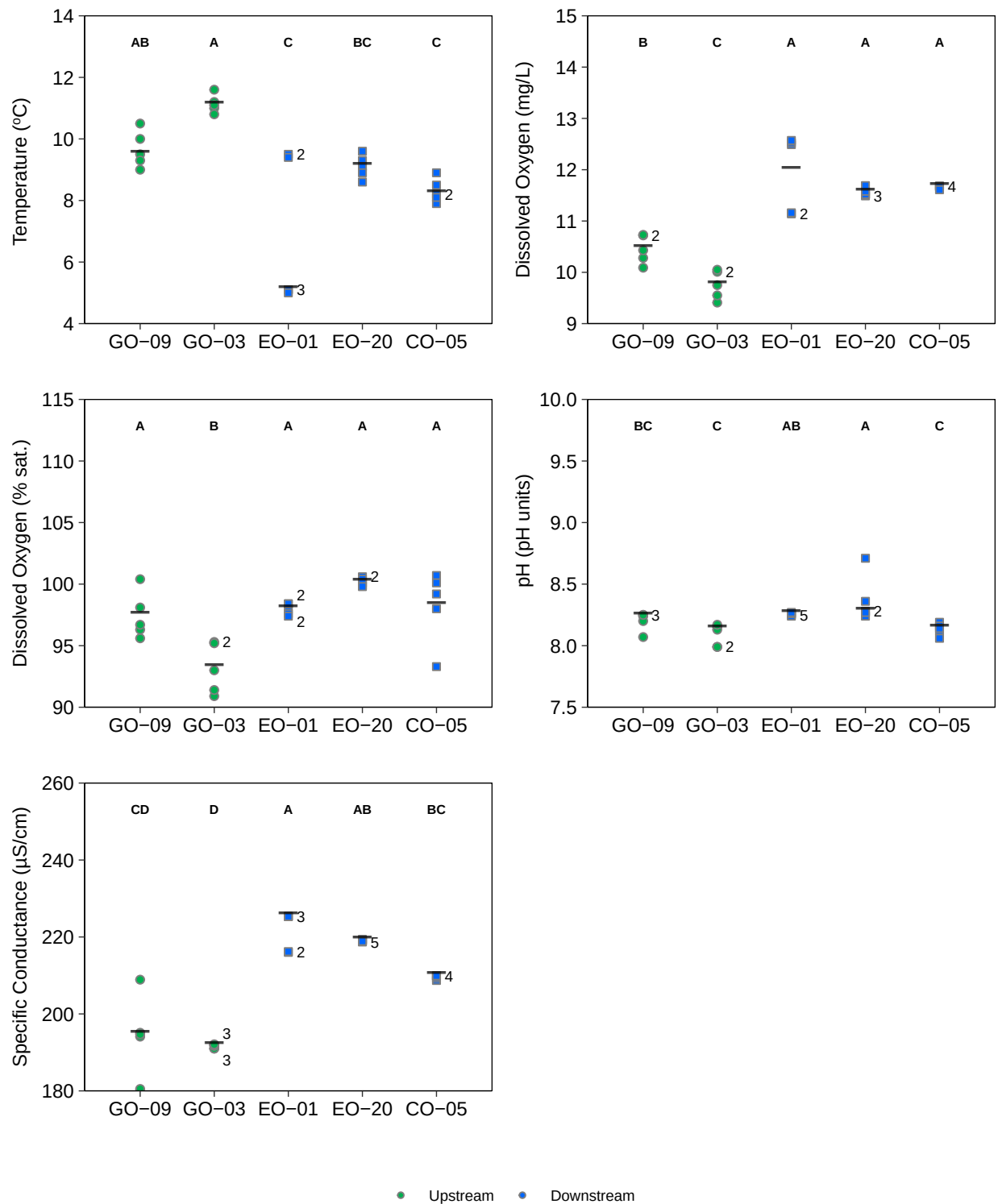


**Figure C.22:** In Situ Water Quality Measurements Collected at Mary River Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020

Notes: Study areas with the same letters do not differ significantly (alpha = 0.1).

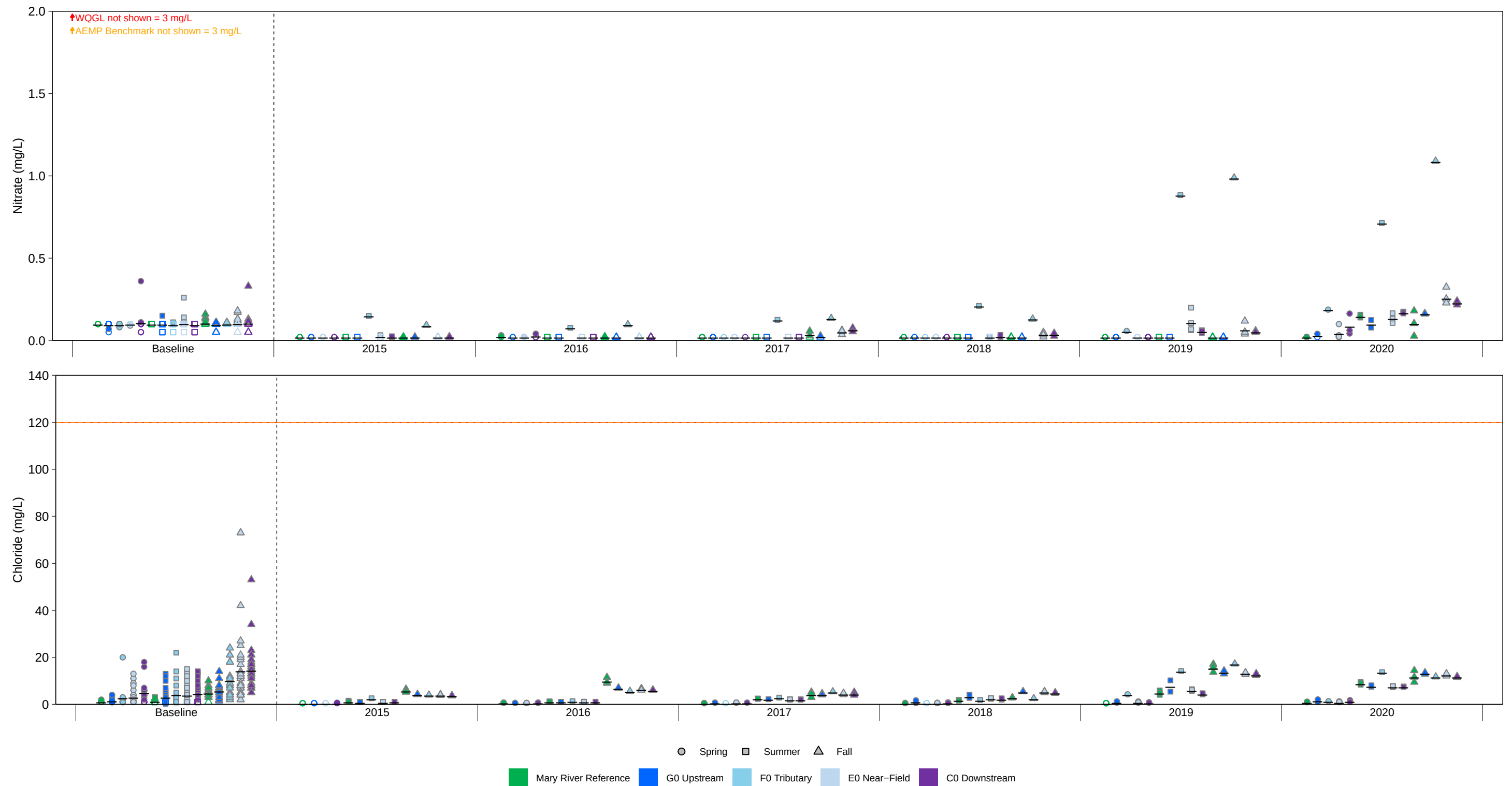


**Figure C.23: Temporal Comparison of Water Chemistry at Mary River Stations Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

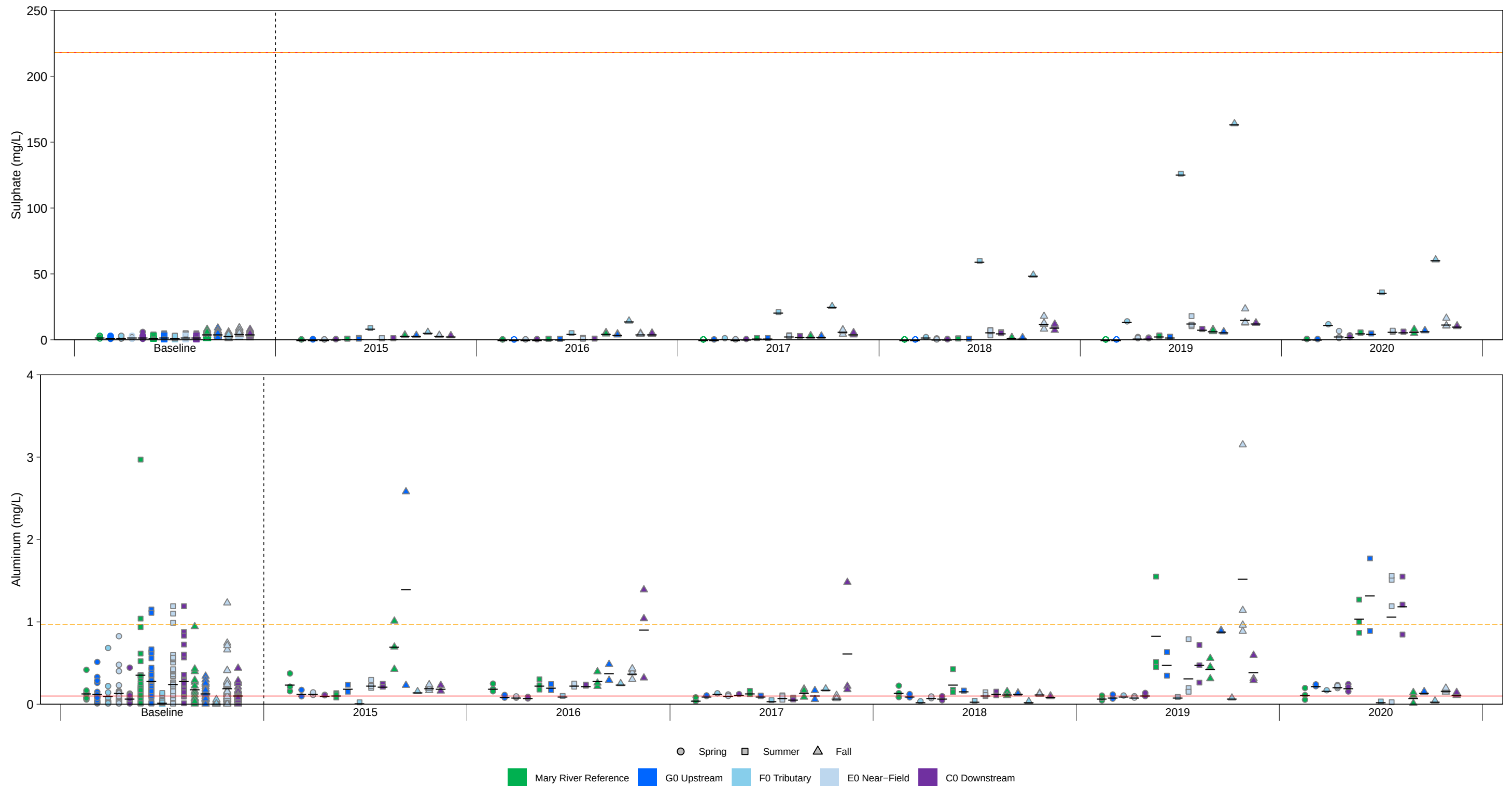


**Figure C.23: Temporal Comparison of Water Chemistry at Mary River Stations Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.





**Figure C.23: Temporal Comparison of Water Chemistry at Mary River Stations Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

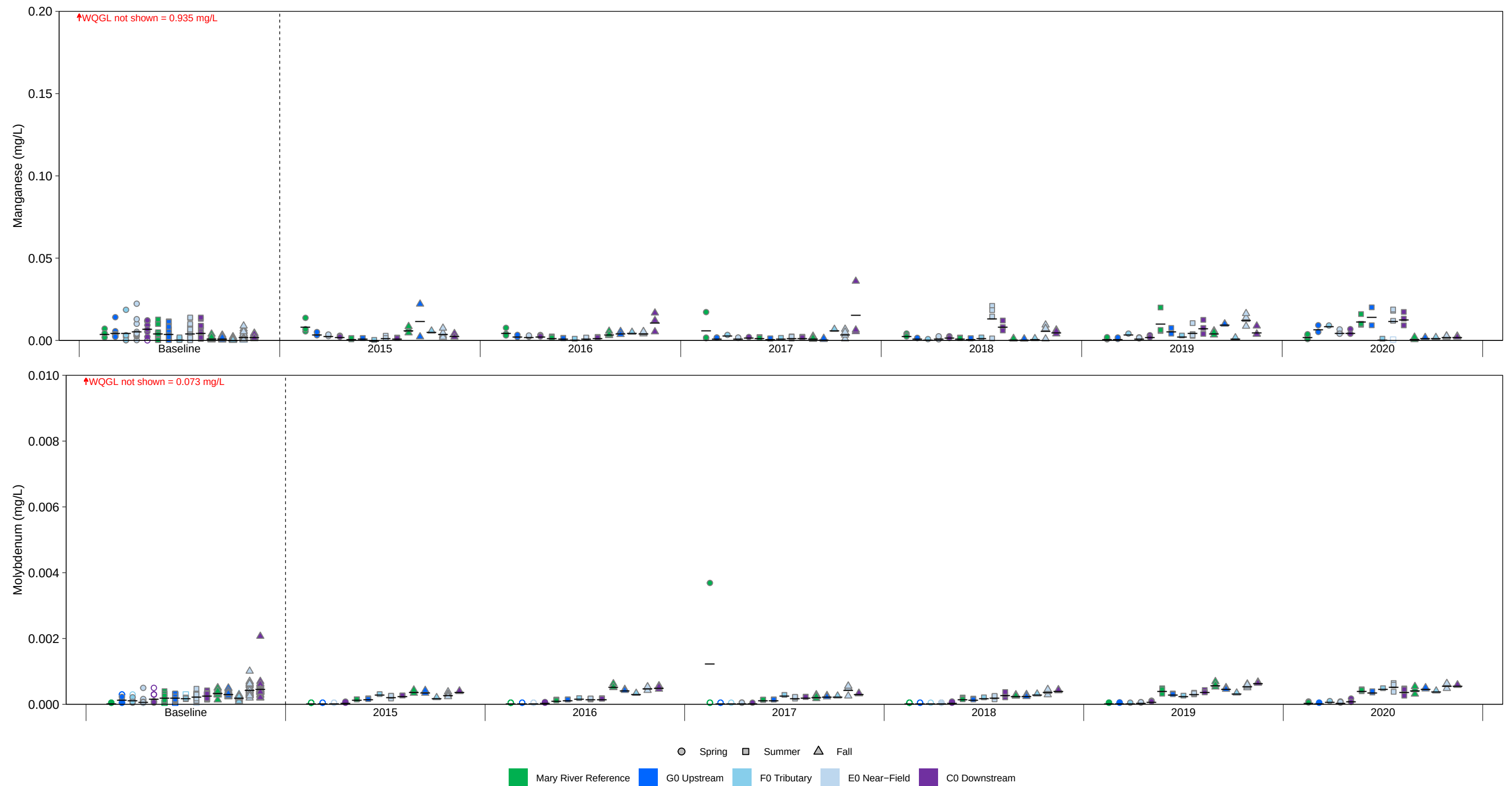


**Figure C.23: Temporal Comparison of Water Chemistry at Mary River Stations Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

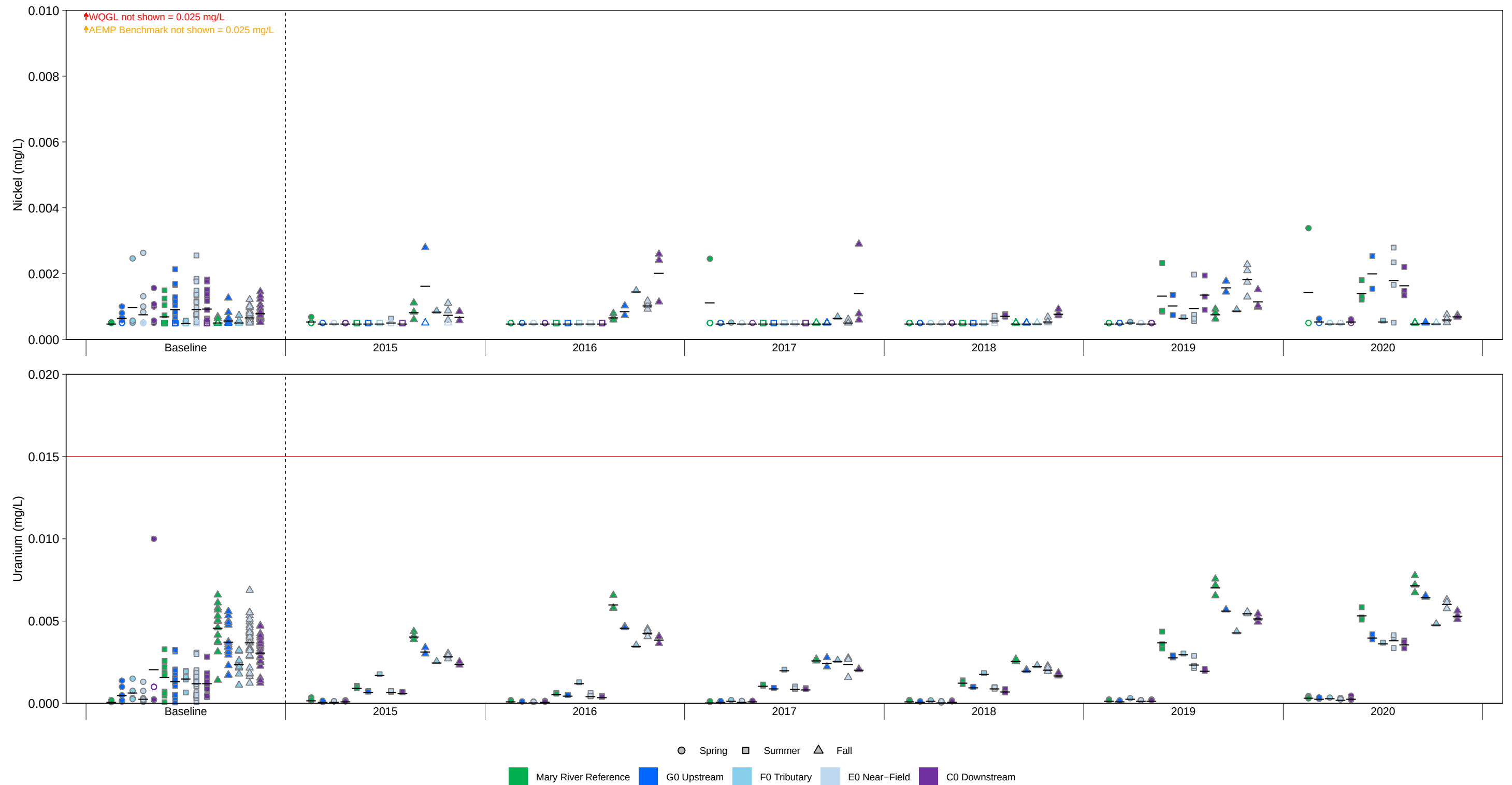


**Figure C.23: Temporal Comparison of Water Chemistry at Mary River Stations Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

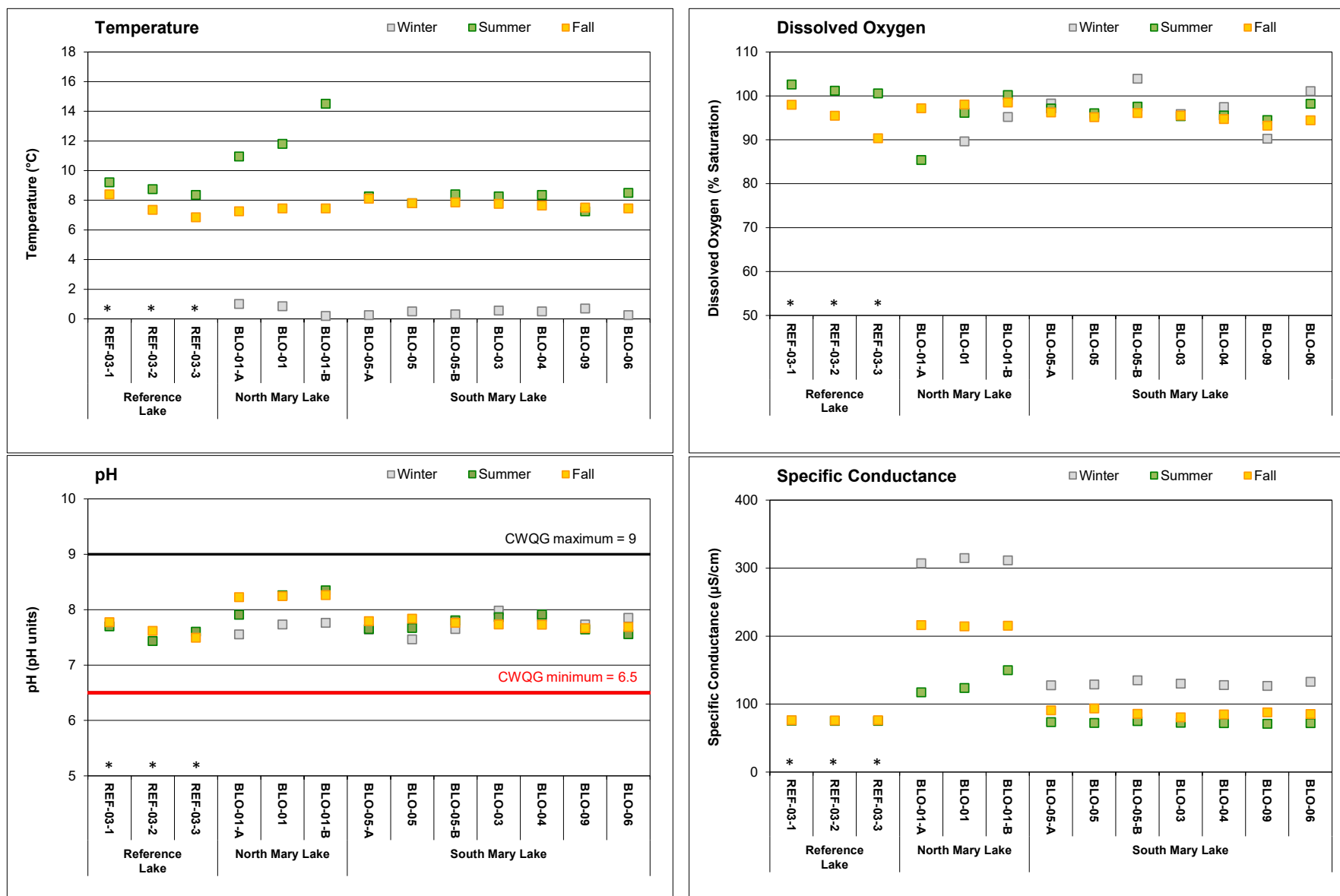


**Figure C.24: Comparison of *In Situ* Water Quality Variables Measured at Mary Lake Water Quality Monitoring Stations in Winter, Summer, and Fall 2020, Mary River Project CREMP**

Notes: Lake values represent mean of surface and bottom *in situ* water quality measurements. \* Reference Lake 3 (REF-03) was not sampled in winter.

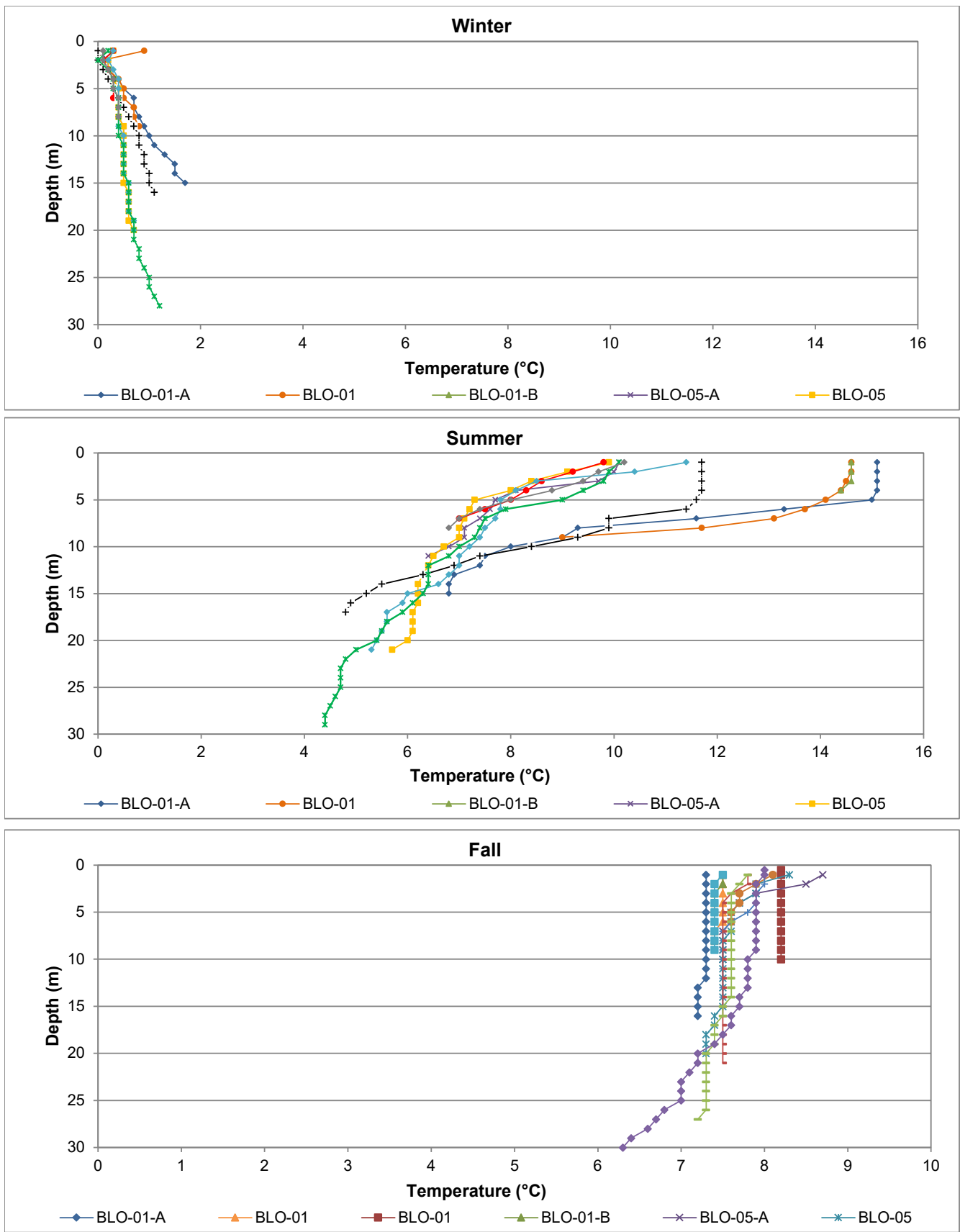


**Figure C.25:** Vertical Profiles of Temperature Measured at Mary Lake in Winter, Summer, and Fall, 2020

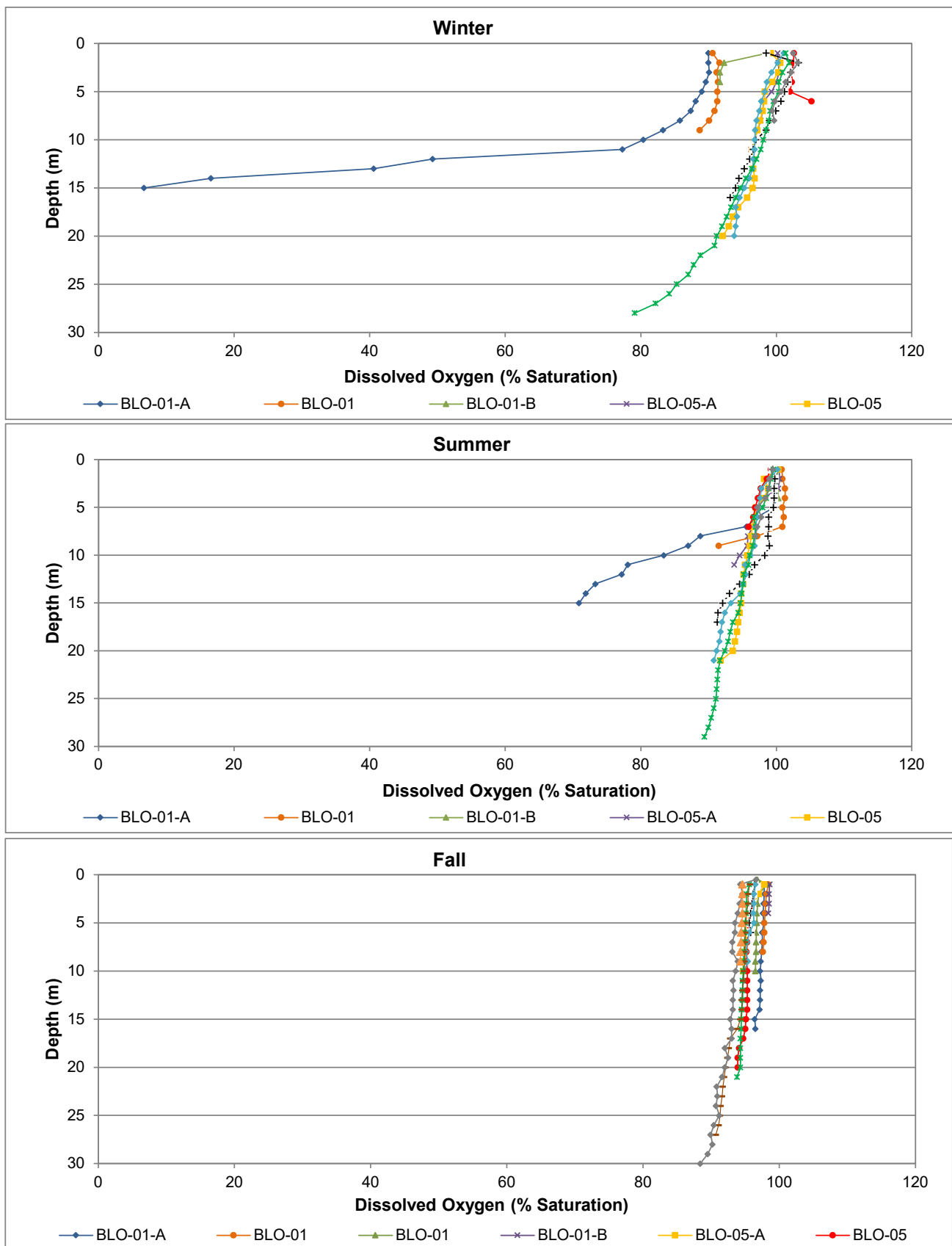


**Figure C.26:** Vertical Profiles of Dissolved Oxygen Measured at Mary Lake in Winter, Summer, and Fall, 2020

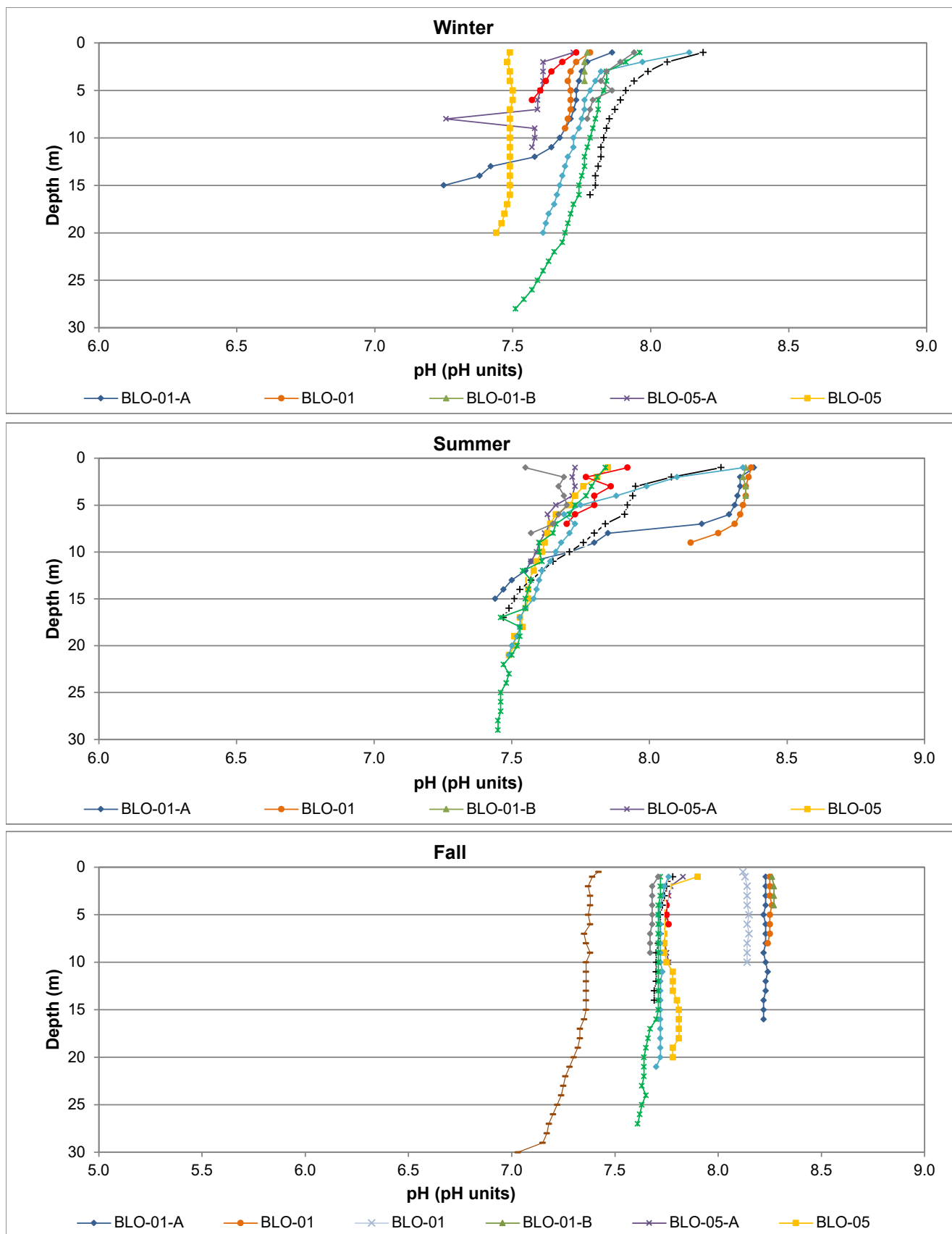


**Figure C.27: Vertical Profiles of pH Measured at Mary Lake in Winter, Summer, and Fall, 2020**

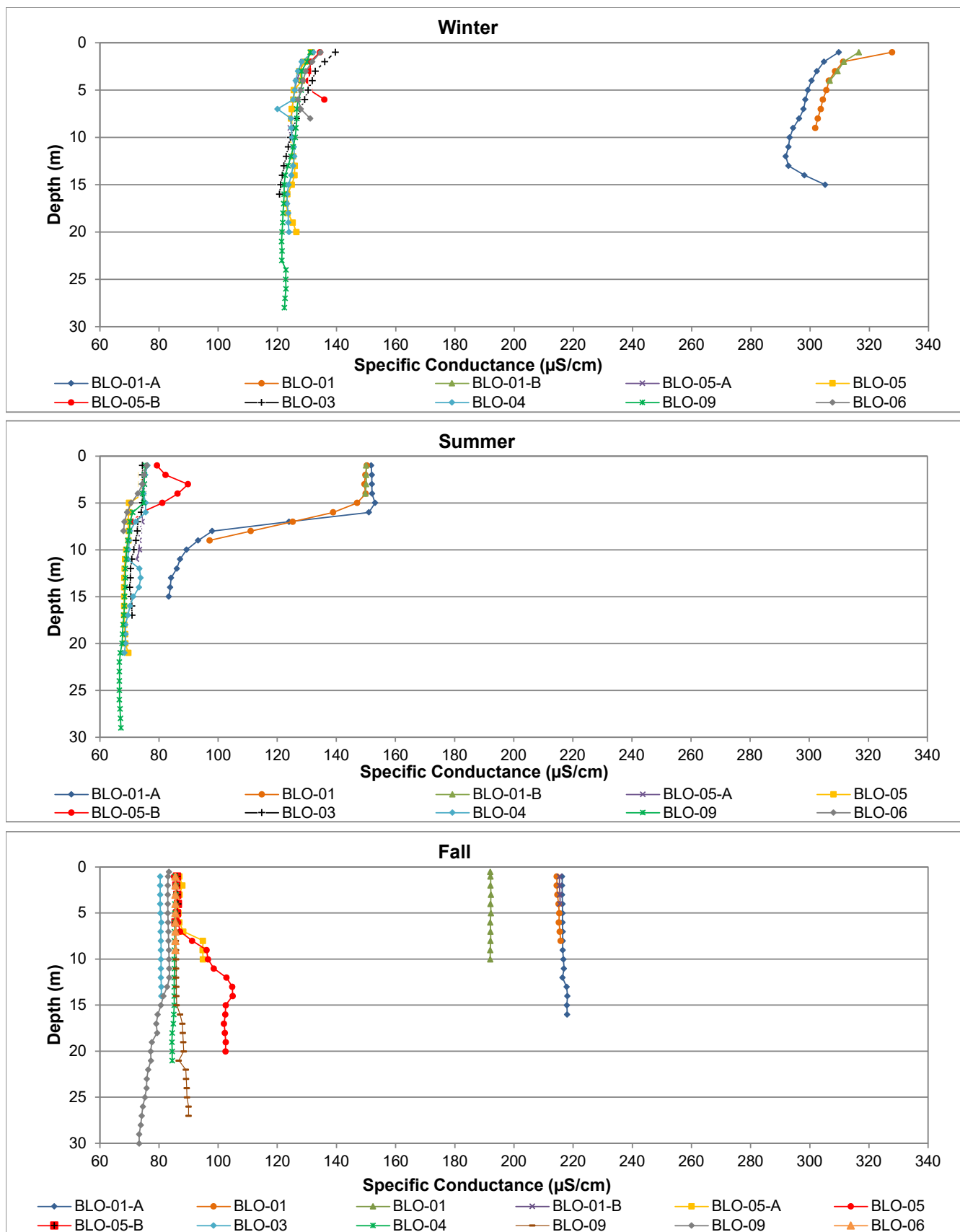


**Figure C.28: Vertical Profiles of Specific Conductance Measured at Mary Lake in Winter, Summer, and Fall, 2020**



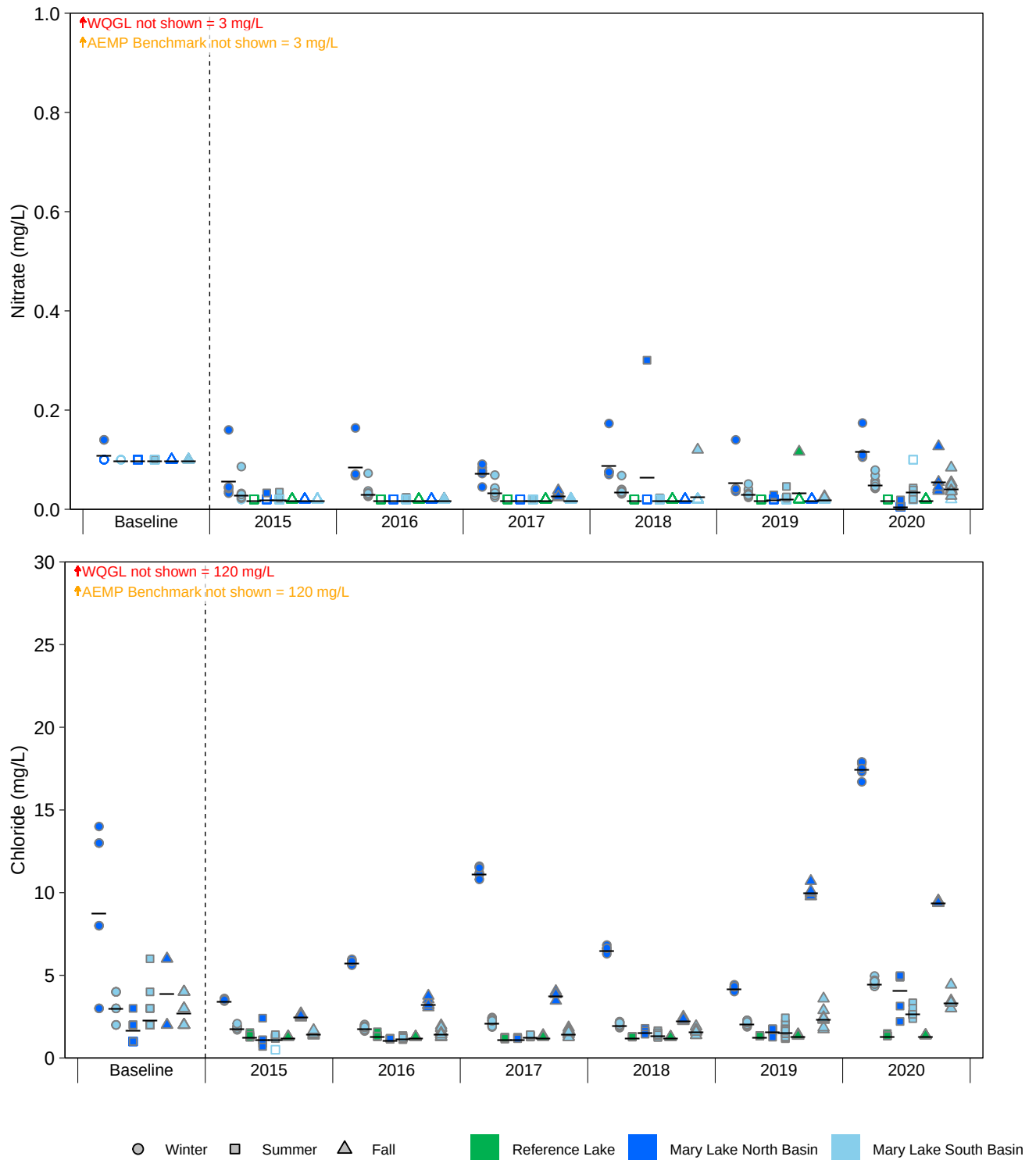


**Figure C.29: Temporal Comparison of Water Chemistry at Mary Lake (BL0) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

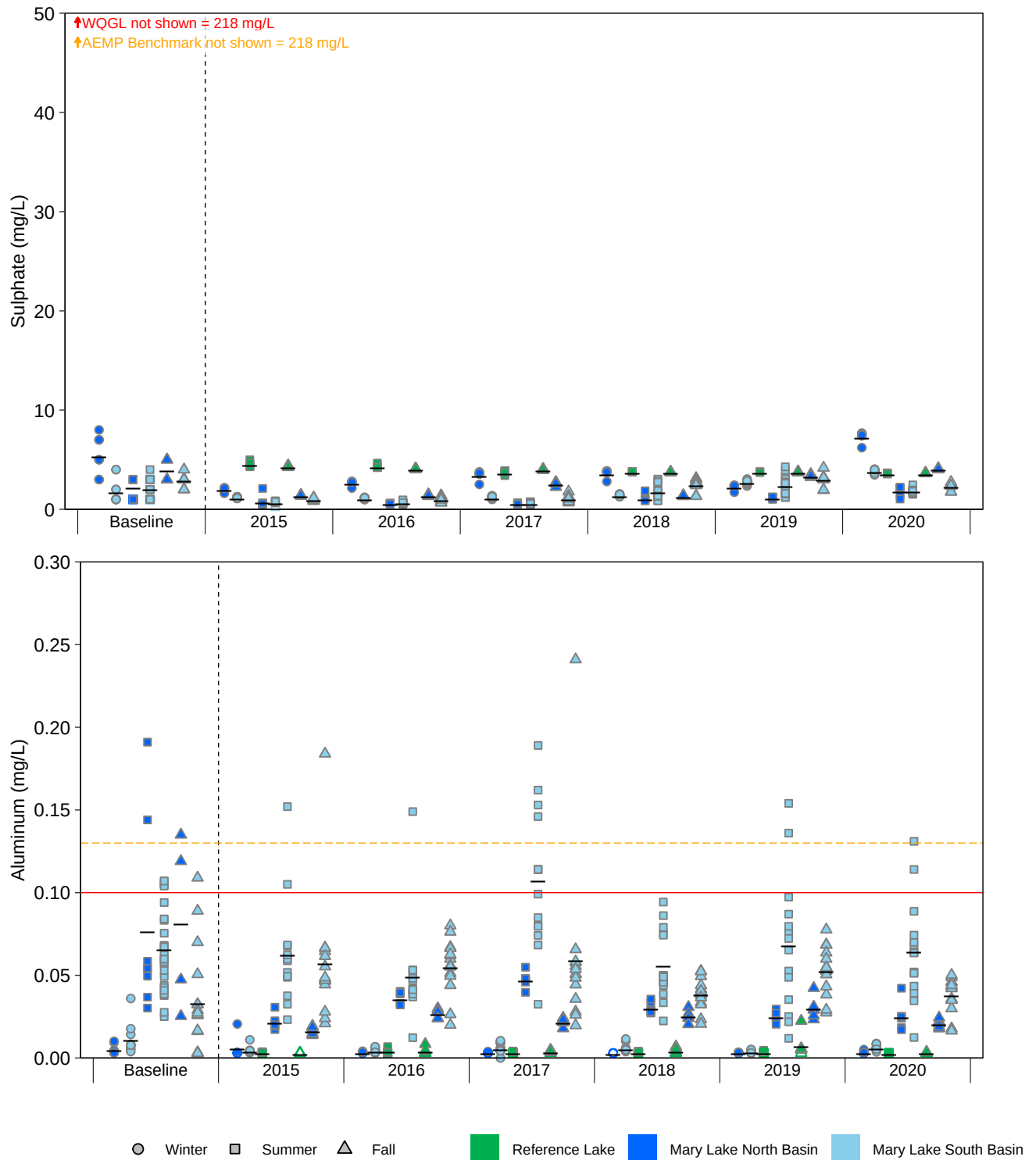


**Figure C.29: Temporal Comparison of Water Chemistry at Mary Lake (BL0) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

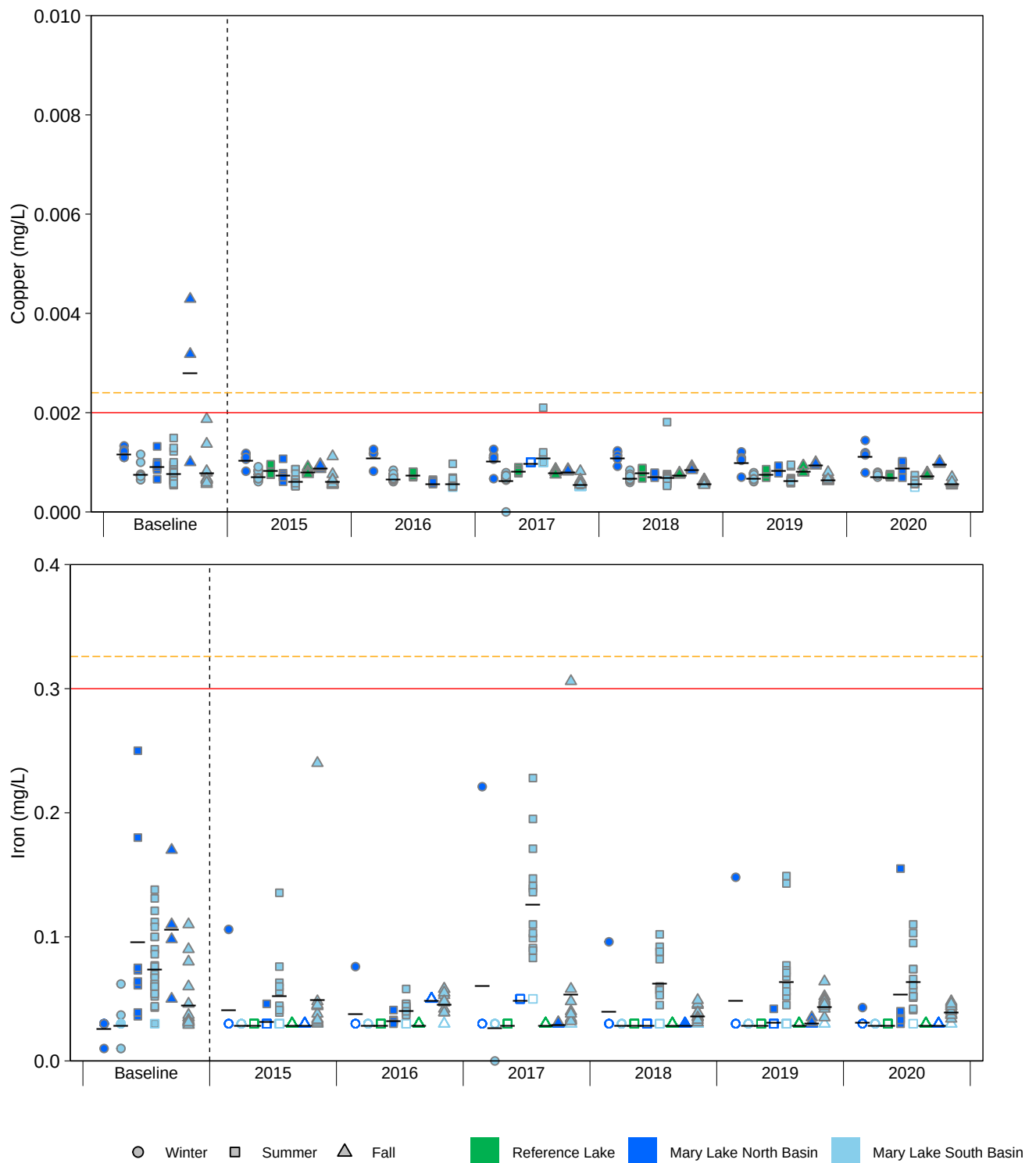


**Figure C.29: Temporal Comparison of Water Chemistry at Mary Lake (BL0) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

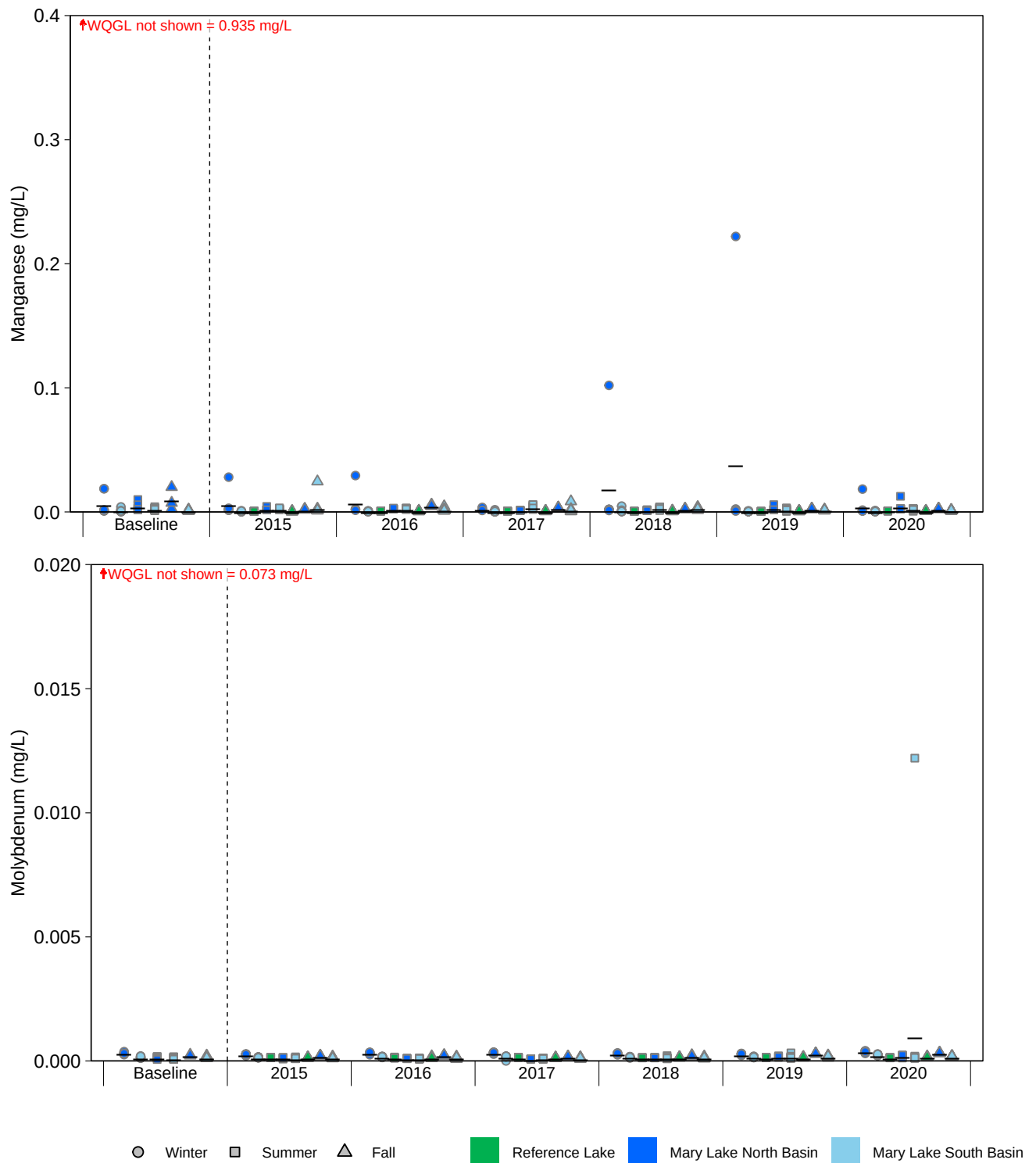


**Figure C.29: Temporal Comparison of Water Chemistry at Mary Lake (BL0) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

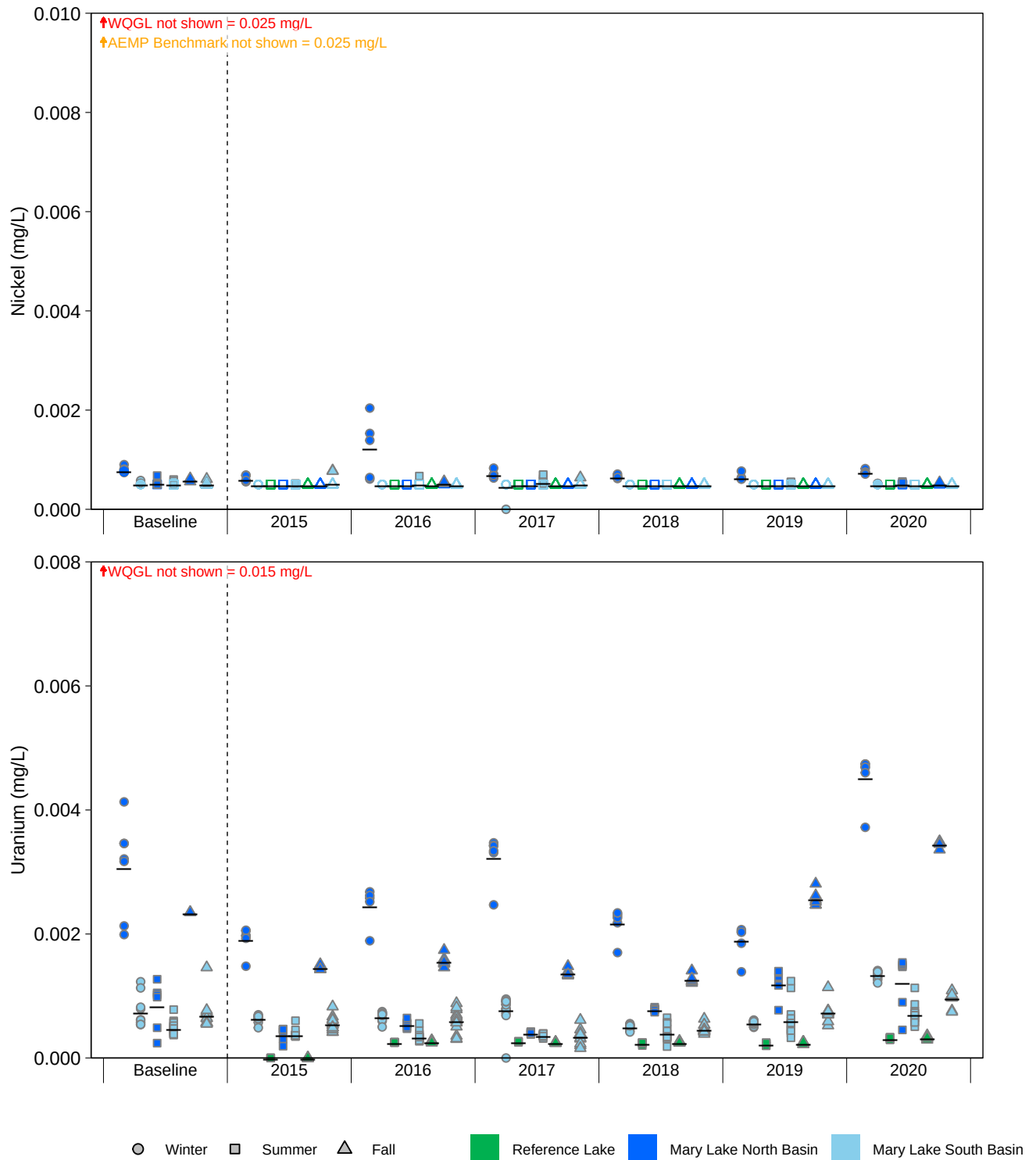


**Figure C.29: Temporal Comparison of Water Chemistry at Mary Lake (BL0) Over Mine Baseline (2006 to 2013) and Operations (2015 to 2020) Periods**

Notes: Concentrations below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL and the open symbol represents one or more values reported below the LRL. Red line indicates Water Quality Guidelines; orange dashed line indicates AEMP Benchmark.

**Table C.1: *In Situ* Water Quality Data Collected from Lotic Environments for the Mary River Project CREMP, Spring 2020**

| Study Area             |                          | Station  | Sampling Date | <i>In Situ</i> Water Quality Parameter |                  |        |      |                              |                 |
|------------------------|--------------------------|----------|---------------|----------------------------------------|------------------|--------|------|------------------------------|-----------------|
|                        |                          |          |               | Temperature (°C)                       | Dissolved Oxygen |        | pH   | Specific Conductance (µS/cm) | Turbidity (NTU) |
|                        |                          |          |               |                                        | (% saturated)    | (mg/L) |      |                              |                 |
| Camp Lake System       | Reference Creek Stations | CLT-REF4 | 4-Jul-20      | 5.9                                    | 97.3             | 12.1   | 7.70 | 55.8                         | -0.30           |
|                        |                          | CLT-REF3 | 4-Jul-20      | 4.9                                    | 97.9             | 12.6   | 7.71 | 54.9                         | -0.84           |
|                        |                          | MRY-REF3 | 4-Jul-20      | 3.7                                    | 98.3             | 13.0   | 7.67 | 33.1                         | 5.30            |
|                        |                          | MRY-REF2 | 4-Jul-20      | 5.5                                    | 98.1             | 12.4   | 7.62 | 56.9                         | -0.50           |
|                        | CLT-1                    | L1-08    | 4-Jul-20      | 3.2                                    | 96.2             | 12.9   | 7.79 | 90.7                         | 0.35            |
|                        |                          | L1-02    | 2-Jul-20      | 11.7                                   | 96.6             | 10.5   | 8.02 | 114.8                        | 0.28            |
|                        |                          | L2-03    | 2-Jul-20      | 15.7                                   | 97.7             | 9.7    | 8.01 | 244.9                        | 15.90           |
|                        |                          | L1-09    | 2-Jul-20      | 13.0                                   | 97.1             | 10.2   | 8.12 | 141.0                        | 1.97            |
|                        |                          | L1-05    | 3-Jul-20      | 10.0                                   | 99.0             | 11.2   | 8.13 | 144.0                        | 1.13            |
|                        |                          | L0-01    | 3-Jul-20      | 9.3                                    | 98.9             | 11.4   | 7.98 | 147.8                        | 0.61            |
|                        | CLT-2                    | K0-01    | 3-Jul-20      | 9.4                                    | 98.7             | 11.3   | 7.95 | 143.2                        | -0.54           |
|                        | Camp Lake                | J0-01    | 4-Jul-20      | 3.3                                    | 95.8             | 12.9   | 7.88 | 151.8                        | -0.07           |
| Sheardown Lake System  | SDL Tribs                | D1-05    | 2-Jul-20      | 8.4                                    | 94.8             | 11.3   | 8.00 | 142.7                        | 5.03            |
|                        |                          | D1-00    | 2-Jul-20      | 14.3                                   | 96.8             | 9.9    | 8.05 | 264.0                        | 3.26            |
| Mary River/Lake System | Tom River                | I0-01    | 4-Jul-20      | 7.1                                    | 99.6             | 12.1   | 7.73 | 61.9                         | 1.16            |
|                        | Mary River               | G0-09-A  | 4-Jul-20      | 4.9                                    | 95.5             | 12.3   | 7.75 | 66.6                         | -0.12           |
|                        |                          | G0-09    | 4-Jul-20      | 4.6                                    | 95.5             | 12.3   | 7.68 | 63.0                         | 1.50            |
|                        |                          | G0-09-B  | 4-Jul-20      | 3.8                                    | 96.1             | 12.7   | 7.71 | 40.9                         | 9.20            |
|                        |                          | G0-03    | 3-Jul-20      | 10.8                                   | 96.9             | 10.8   | 7.63 | 45.4                         | 10.76           |
|                        |                          | G0-01    | 3-Jul-20      | 9.9                                    | 100.6            | 11.4   | 7.73 | 40.6                         | 6.43            |
|                        |                          | F0-01    | 3-Jul-20      | 11.0                                   | 98.7             | 10.9   | 7.90 | 94.3                         | 5.25            |
|                        |                          | E0-10    | 3-Jul-20      | 10.6                                   | 100.0            | 11.1   | 7.74 | 73.5                         | 5.20            |
|                        |                          | E0-03    | 3-Jul-20      | 8.6                                    | 100.2            | 11.7   | 7.90 | 44.3                         | 6.71            |
|                        |                          | E0-20    | 3-Jul-20      | 7.3                                    | 100.0            | 12.0   | 7.68 | 41.7                         | 6.52            |
|                        |                          | E0-21    | 3-Jul-20      | 7.7                                    | 98.6             | 11.8   | 8.01 | 41.5                         | 6.85            |
|                        |                          | C0-10    | 3-Jul-20      | 7.0                                    | 101.3            | 12.3   | 7.68 | 40.5                         | 7.01            |
|                        |                          | C0-05    | 3-Jul-20      | 6.4                                    | 101.8            | 12.6   | 7.90 | 65.8                         | 6.94            |
|                        |                          | C0-01    | 3-Jul-20      | 6.2                                    | 101.8            | 12.6   | 7.65 | 50.2                         | 9.42            |

**Table C.2: *In Situ* Water Quality Data Collected from Lotic Environments for the Mary River Project CREMP, Summer 2020**

| Study Area             |                          | Station  | Sampling Date | <i>In Situ</i> Water Quality Parameter |                  |        |      |                              |                 |
|------------------------|--------------------------|----------|---------------|----------------------------------------|------------------|--------|------|------------------------------|-----------------|
|                        |                          |          |               | Temperature (°C)                       | Dissolved Oxygen |        | pH   | Specific Conductance (µS/cm) | Turbidity (NTU) |
|                        |                          |          |               |                                        | (% saturated)    | (mg/L) |      |                              |                 |
| Camp Lake System       | Reference Creek Stations | CLT-REF4 | 2-Aug-20      | 8.8                                    | 97.8             | 11.4   | 8.08 | 141.9                        | -0.96           |
|                        |                          | CLT-REF3 | 2-Aug-20      | 5.8                                    | 98.5             | 12.4   | 8.03 | 121.6                        | -0.82           |
|                        |                          | MRY-REF3 | 2-Aug-20      | 11.0                                   | 99.9             | 11.0   | 7.88 | 117.0                        | 20.67           |
|                        |                          | MRY-REF2 | 2-Aug-20      | 13.3                                   | 101.0            | 10.6   | 8.06 | 126.3                        | 0.28            |
|                        | CLT-1                    | L1-08    | 2-Aug-20      | 4.6                                    | 99.0             | 12.8   | 8.01 | 151.5                        | -0.87           |
|                        |                          | L1-02    | 1-Aug-20      | 9.6                                    | 98.5             | 11.2   | 8.37 | 218.8                        | -1.97           |
|                        |                          | L2-03    | 1-Aug-20      | 12.7                                   | 97.2             | 10.3   | 8.11 | 376.5                        | 1.09            |
|                        |                          | L1-09    | 1-Aug-20      | 10.9                                   | 99.2             | 11.0   | 8.28 | 265.4                        | -1.19           |
|                        |                          | L1-05    | 1-Aug-20      | 10.2                                   | 97.7             | 11.0   | 8.37 | 269.9                        | -0.84           |
|                        |                          | L0-01    | 1-Aug-20      | 10.5                                   | 99.2             | 11.1   | 8.34 | 280.3                        | -1.25           |
|                        | CLT-2                    | K0-01    | 1-Aug-20      | 10.3                                   | 99.9             | 11.2   | 8.43 | 293.2                        | -1.65           |
|                        | Camp Lake                | J0-01    | 2-Aug-20      | 11.8                                   | 103.1            | 11.2   | 8.05 | 149.8                        | -0.49           |
| Sheardown Lake System  | SDL Tribs                | D1-05    | 2-Aug-20      | 6.6                                    | 92.5             | 11.3   | 7.83 | 216.5                        | -1.05           |
|                        |                          | D1-00    | 2-Aug-20      | 9.8                                    | 96.1             | 10.9   | 7.96 | 453.1                        | 0.67            |
| Mary River/Lake System | Tom River                | I0-01    | 2-Aug-20      | 10.6                                   | 100.4            | 11.2   | 8.31 | 216.3                        | -1.28           |
|                        | Mary River               | G0-09-A  | 2-Aug-20      | 9.0                                    | 96.1             | 11.2   | 8.15 | 187.2                        | 14.52           |
|                        |                          | G0-09    | 1-Aug-20      | 10.0                                   | 96.8             | 10.9   | 8.38 | 184.9                        | 31.42           |
|                        |                          | G0-09-B  | 1-Aug-20      | 10.2                                   | 96.7             | 10.9   | 8.33 | 172.4                        | 24.20           |
|                        |                          | G0-03    | 1-Aug-20      | 4.8                                    | 96.5             | 11.0   | 8.02 | 161.5                        | 42.01           |
|                        |                          | G0-01    | 31-Jul-20     | 13.3                                   | 98.5             | 10.3   | 8.31 | 167.1                        | 21.01           |
|                        |                          | F0-01    | 31-Jul-20     | 11.7                                   | 97.7             | 10.6   | 8.33 | 335.6                        | -1.17           |
|                        |                          | E0-10    | 31-Jul-20     | 13.1                                   | 98.4             | 10.3   | 8.23 | 171.2                        | 30.25           |
|                        |                          | E0-03    | 31-Jul-20     | 12.1                                   | 99.0             | 10.6   | 8.16 | 172.7                        | 42.19           |
|                        |                          | E0-20    | 31-Jul-20     | 12.0                                   | 100.3            | 10.8   | 8.21 | 172.1                        | 41.64           |
|                        |                          | E0-21    | 31-Jul-20     | 11.7                                   | 99.2             | 10.8   | 8.23 | 172.3                        | 43.72           |
|                        |                          | C0-10    | 30-Jul-20     | 11.1                                   | 98.1             | 10.8   | 8.15 | 168.4                        | 21.33           |
|                        |                          | C0-05    | 30-Jul-20     | 11.7                                   | 99.3             | 10.7   | 8.24 | 166.6                        | 29.80           |
|                        |                          | C0-01    | 30-Jul-20     | 12.0                                   | 98.4             | 10.6   | 8.26 | 168.0                        | 34.42           |

**Table C.3: *In Situ* Water Quality Data Collected From Lotic Environments for the Mary River Project CREMP, Fall 2020**

| Study Area             |                          | Station  | Sampling Date | <i>In Situ</i> Water Quality Parameter |                  |        |      |                              |                 |
|------------------------|--------------------------|----------|---------------|----------------------------------------|------------------|--------|------|------------------------------|-----------------|
|                        |                          |          |               | Temperature (°C)                       | Dissolved Oxygen |        | pH   | Specific Conductance (µS/cm) | Turbidity (NTU) |
|                        |                          |          |               |                                        | (% saturated)    | (mg/L) |      |                              |                 |
| Camp Lake System       | Reference Creek Stations | CLT-REF4 | 21-Aug-19     | 4.5                                    | 96.9             | 12.6   | 8.15 | 182.8                        | 0.4             |
|                        |                          | CLT-REF3 | 21-Aug-19     | 2.9                                    | 98.3             | 13.3   | 8.04 | 101.6                        | 0.5             |
|                        |                          | MRY-REF3 | 21-Aug-19     | 5.6                                    | 97.9             | 12.3   | 7.70 | 170.7                        | 8.0             |
|                        |                          | MRY-REF2 | 21-Aug-19     | 5.1                                    | 97.5             | 12.5   | 8.02 | 182.4                        | 0.6             |
|                        | CLT-1                    | L1-08    | 18-Aug-19     | 2.7                                    | 97.8             | 13.3   | 8.21 | 188.9                        | 0.3             |
|                        |                          | L1-02    | 19-Aug-19     | 4.8                                    | 97.7             | 12.6   | 8.20 | 243.9                        | 0.2             |
|                        |                          | L2-03    | 19-Aug-19     | 11.7                                   | 98.3             | 10.7   | 8.01 | 443.3                        | 2.3             |
|                        |                          | L1-09    | 19-Aug-19     | 4.8                                    | 96.7             | 12.4   | 7.98 | 301.9                        | 0.6             |
|                        |                          | L1-05    | 19-Aug-19     | 4.7                                    | 97.2             | 12.5   | 8.02 | 304.0                        | 0.6             |
|                        |                          | L0-01    | 19-Aug-19     | 9.5                                    | 97.2             | 11.1   | 8.27 | 310.4                        | 0.7             |
|                        | CLT-2                    | K0-01    | 19-Aug-19     | 10.1                                   | 99.2             | 11.2   | 8.42 | 341.7                        | 0.2             |
|                        | Camp Lake                | J0-01    | 18-Aug-19     | 9.3                                    | 97.8             | 11.2   | 7.79 | 155.1                        | 0.3             |
| Sheardown Lake System  | SDL Tribs                | D1-05    | 19-Aug-19     | 5.3                                    | 94.9             | 12.0   | 7.98 | 243.3                        | 0.2             |
|                        |                          | D1-00    | 19-Aug-19     | 10.3                                   | 98.6             | 11.1   | 8.16 | 365.2                        | 2.3             |
| Mary River/Lake System | Tom River                | I0-01    | 19-Aug-19     | 6.3                                    | 99.4             | 12.3   | 8.25 | 263.5                        | 0.2             |
|                        | Mary River               | G0-09-A  | 20-Aug-19     | 9.6                                    | 96.8             | 11.0   | 8.38 | 246.6                        | 0.3             |
|                        |                          | G0-09    | 20-Aug-19     | 9.5                                    | 97.4             | 11.1   | 8.40 | 247.1                        | 3.2             |
|                        |                          | G0-09-B  | 20-Aug-19     | 9.8                                    | 99.0             | 11.0   | 8.36 | 237.0                        | 6.0             |
|                        |                          | G0-03    | 20-Aug-19     | 8.4                                    | 98.5             | 11.6   | 8.33 | 224.0                        | 4.1             |
|                        |                          | G0-01    | 20-Aug-19     | 6.5                                    | 99.2             | 12.2   | 8.26 | 227.1                        | 5.5             |
|                        |                          | F0-01    | 20-Aug-19     | 7.2                                    | 98.2             | 11.9   | 8.33 | 399.6                        | 1.3             |
|                        |                          | E0-10    | 20-Aug-19     | 6.2                                    | 98.9             | 12.2   | 8.27 | 255.4                        | 5.2             |
|                        |                          | E0-03    | 20-Aug-19     | 5.2                                    | 98.9             | 12.6   | 8.30 | 239.5                        | 6.6             |
|                        |                          | E0-20    | 20-Aug-19     | 5.6                                    | 100.1            | 12.6   | 8.22 | 236.5                        | 7.7             |
|                        |                          | E0-21    | 20-Aug-19     | 5.2                                    | 100.0            | 12.7   | 8.22 | 245.3                        | 8.0             |
|                        |                          | C0-10    | 20-Aug-19     | 6.5                                    | 102.9            | 12.6   | 8.23 | 234.9                        | 4.1             |
|                        |                          | C0-05    | 20-Aug-19     | 5.8                                    | 101.2            | 12.7   | 8.02 | 231.3                        | 4.7             |
|                        |                          | C0-01    | 20-Aug-19     | 5.5                                    | 100.3            | 12.7   | 8.00 | 229.4                        | 2.9             |



Table C.4: Dissolved Metal Concentrations at Reference Creek Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Spring Sampling Event |            |            |            | Summer Sampling Event |            |            |            | Fall Sampling Event |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|-----------------------|------------|------------|------------|---------------------|------------|------------|------------|
|                  |                 |       | CLT-REF4              | CLT-REF3   | MRY-REF3   | MRY-REF2   | CLT-REF4              | CLT-REF3   | MRY-REF3   | MRY-REF2   | CLT-REF4            | CLT-REF3   | MRY-REF3   | MRY-REF2   |
|                  |                 |       | 04-Jul-20             | 04-Jul-20  | 04-Jul-20  | 04-Jul-20  | 03-Aug-20             | 03-Aug-20  | 03-Aug-20  | 03-Aug-20  | 29-Aug-20           | 29-Aug-20  | 29-Aug-20  | 29-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0200                | 0.0128     | 0.0289     | 0.0120     | 0.0055                | 0.0096     | 0.111      | 0.0173     | 0.0066              | 0.0083     | 0.0442     | 0.0152     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00275               | 0.00344    | 0.00330    | 0.00313    | 0.00588               | 0.00643    | 0.0106     | 0.00808    | 0.00709             | 0.00900    | 0.0142     | 0.0100     |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00050   | <0.00010   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00050   | <0.000050  | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010                | <0.010     | <0.010     | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010  | <0.0000050 | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L  | 5.76                  | 5.49       | 2.65       | 5.43       | 13.8                  | 11.7       | 9.72       | 12.4       | 18.9                | 16.0       | 14.7       | 17.1       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | <0.00050              | 0.00086    | 0.00053    | <0.00050   | 0.00055               | 0.00110    | 0.00122    | 0.00065    | 0.00064             | 0.00119    | 0.00116    | 0.00071    |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030     | <0.030     | <0.030     | <0.030                | <0.030     | 0.054      | <0.030     | <0.030              | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050             | <0.000050  | 0.000077   | <0.000050  | <0.000050           | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010               | <0.0010    | 0.0013     | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    |
|                  | Magnesium (Mg)  | mg/L  | 3.27                  | 3.32       | 1.39       | 3.21       | 7.73                  | 6.92       | 4.87       | 7.01       | 11.3                | 10.7       | 7.48       | 10.4       |
|                  | Manganese (Mn)  | mg/L  | 0.000105              | 0.000293   | 0.000726   | 0.000422   | <0.000070             | 0.000805   | 0.00067    | 0.000526   | 0.000073            | 0.000955   | 0.000360   | 0.000611   |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000094              | 0.000305   | 0.000134   | 0.000089   | 0.000353              | 0.000745   | 0.000639   | 0.000247   | 0.000563            | 0.000887   | 0.000619   | 0.000329   |
|                  | Nickel (Ni)     | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050              | 0.00065    | <0.00050   | <0.00050   | <0.00050            | 0.00075    | <0.00050   | <0.00050   |
|                  | Potassium (K)   | mg/L  | 0.38                  | 0.43       | 0.44       | 0.43       | 0.68                  | 0.73       | 1.14       | 0.85       | 0.83                | 0.96       | 1.31       | 1.05       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010               | <0.0010    | <0.000050  | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 0.51                  | 0.61       | 0.42       | 0.43       | 0.64                  | 0.86       | 1.22       | 0.66       | 0.60                | 0.91       | 1.08       | 0.79       |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010  | <0.000050  | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 0.584                 | 0.575      | 1.14       | 0.959      | 2.33                  | 1.56       | 4.71       | 2.66       | 3.38                | 2.22       | 6.73       | 4.09       |
|                  | Strontium (Sr)  | mg/L  | 0.00462               | 0.00385    | 0.00591    | 0.00467    | 0.0117                | 0.00841    | 0.0236     | 0.0123     | 0.0155              | 0.0115     | 0.0320     | 0.0164     |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.000010  | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010                | <0.010     | 0.00354    | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.000517              | 0.000447   | 0.000260   | 0.000330   | 0.00824               | 0.00423    | 0.00154    | 0.00212    | 0.0136              | 0.00854    | 0.00326    | 0.00372    |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010               | <0.0010    | <0.00050   | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030               | <0.0030    | <0.0010    | <0.0030    | <0.0030             | <0.0030    | <0.0030    | <0.0030    |

Note: "-" indicates no data reported.

**Table C.5: *In Situ* Water Quality Profile Data Collected at Reference Lake 3 Water Quality Monitoring Stations in Summer 2020, Mary River Project CREMP**

| Depth<br>(m)   | Temperature (°C) |          |          | Dissolved Oxygen (mg/L) |          |          | Dissolved Oxygen (% Saturation) |          |          | pH (pH units) |          |          | Specific Conductance (µS/cm) |          |          |
|----------------|------------------|----------|----------|-------------------------|----------|----------|---------------------------------|----------|----------|---------------|----------|----------|------------------------------|----------|----------|
|                | REF3-03          | REF3-02  | REF3-01  | REF3-03                 | REF3-02  | REF3-01  | REF3-03                         | REF3-02  | REF3-01  | REF3-03       | REF3-02  | REF3-01  | REF3-03                      | REF3-02  | REF3-01  |
| Date Collected | 2-Aug-20         | 2-Aug-20 | 2-Aug-20 | 2-Aug-20                | 2-Aug-20 | 2-Aug-20 | 2-Aug-20                        | 2-Aug-20 | 2-Aug-20 | 2-Aug-20      | 2-Aug-20 | 2-Aug-20 | 2-Aug-20                     | 2-Aug-20 | 2-Aug-20 |
| 1.0            | 12.0             | 12.2     | 12.2     | 10.89                   | 10.78    | 10.80    | 101.0                           | 100.6    | 100.7    | 7.90          | 7.93     | 8.03     | 76.0                         | 76.3     | 76.0     |
| 2.0            | 12.0             | 12.2     | 12.2     | 10.91                   | 10.84    | 10.83    | 101.1                           | 100.7    | 100.9    | 7.88          | 7.83     | 7.95     | 76.1                         | 76.2     | 76.0     |
| 3.0            | 11.9             | 12.2     | 12.2     | 10.94                   | 10.77    | 10.83    | 101.2                           | 100.3    | 101.0    | 7.87          | 7.75     | 7.93     | 76.1                         | 76.1     | 76.1     |
| 4.0            | 11.6             | 12.2     | 12.2     | 11.17                   | 10.80    | 10.83    | 102.1                           | 100.6    | 101.0    | 7.85          | 7.74     | 7.91     | 76.1                         | 76.2     | 76.1     |
| 5.0            | 10.4             | 12.1     | 12.2     | 11.53                   | 10.79    | 10.83    | 103.1                           | 100.1    | 100.9    | 7.83          | 7.72     | 7.89     | 76.0                         | 76.5     | 76.1     |
| 6.0            | 9.3              | 8.2      | 9.2      | 11.99                   | 12.33    | 11.86    | 104.3                           | 104.1    | 101.8    | 7.75          | 7.61     | 7.85     | 76.1                         | 75.6     | 76.4     |
| 7.0            | 8.4              | 7.5      | 7.5      | 12.35                   | 12.48    | 12.41    | 105.3                           | 104.0    | 103.3    | 7.76          | 7.56     | 7.78     | 75.6                         | 75.4     | 75.8     |
| 8.0            | 7.3              | 7.3      | 7.3      | 12.60                   | 12.51    | 12.52    | 104.6                           | 103.5    | 103.3    | 7.72          | 7.53     | 7.74     | 75.7                         | 75.5     | 75.5     |
| 9.0            | 7.2              | 7.1      | 6.9      | 12.64                   | 12.56    | 12.54    | 104.4                           | 103.6    | 103.1    | 7.70          | 7.51     | 7.70     | 75.4                         | 75.4     | 75.5     |
| 10.0           | 6.7              | 7.0      | 6.7      | 12.74                   | 12.56    | 12.57    | 104.2                           | 103.6    | 102.7    | 7.68          | 7.50     | 7.67     | 75.5                         | 75.5     | 75.4     |
| 11.0           | 6.3              | 6.8      | 6.7      | 12.77                   | 12.56    | 12.57    | 103.5                           | 103.0    | 102.6    | 7.66          | 7.48     | 7.65     | 75.2                         | 75.4     | 75.4     |
| 12.0           | 5.8              | 6.6      | 6.6      | 12.84                   | 12.57    | 12.57    | 102.7                           | 102.5    | 102.4    | 7.64          | 7.47     | 7.64     | 75.5                         | 75.4     | 75.4     |
| 13.0           | 5.7              | 6.4      | 6.5      | 12.81                   | 12.60    | 12.61    | 102.2                           | 102.0    | 102.2    | 7.61          | 7.45     | 7.63     | 75.4                         | 75.4     | 75.5     |
| 14.0           | 5.7              | 6.2      | 6.3      | 12.79                   | 12.60    | 12.61    | 101.7                           | 101.8    | 102.1    | 7.60          | 7.43     | 7.62     | 75.4                         | 75.4     | 75.4     |
| 15.0           | 5.4              | 6.1      | 6.2      | 12.71                   | 12.60    | 12.63    | 100.6                           | 101.6    | 101.9    | 7.56          | 7.42     | 7.62     | 75.4                         | 75.4     | 75.4     |
| 16.0           | 5.3              | 6.1      | -        | 12.71                   | 12.60    | -        | 100.4                           | 101.3    | -        | 7.58          | 7.41     | -        | 75.4                         | 75.4     | -        |
| 17.0           | 5.3              | 5.9      | -        | 12.58                   | 12.59    | -        | 100.0                           | 100.8    | -        | 7.55          | 7.40     | -        | 75.4                         | 75.4     | -        |
| 18.0           | 5.2              | 5.8      | -        | 12.67                   | 12.61    | -        | 99.7                            | 100.8    | -        | 7.54          | 7.40     | -        | 75.4                         | 75.4     | -        |
| 19.0           | 5.2              | 5.7      | -        | 12.65                   | 12.61    | -        | 99.5                            | 100.6    | -        | 7.54          | 7.38     | -        | 75.4                         | 75.4     | -        |
| 20.0           | 5.1              | 5.4      | -        | 12.63                   | 12.54    | -        | 99.2                            | 99.3     | -        | 7.53          | 7.30     | -        | 75.4                         | 75.4     | -        |
| 21.0           | 5.1              | 5.4      | -        | 12.61                   | 12.54    | -        | 98.9                            | 99.3     | -        | 7.52          | 7.31     | -        | 75.4                         | 75.4     | -        |
| 22.0           | 5.1              | 5.4      | -        | 12.60                   | 12.53    | -        | 98.7                            | 99.1     | -        | 7.52          | 7.32     | -        | 75.5                         | 75.5     | -        |
| 23.0           | 5.0              | 5.4      | -        | 12.57                   | 12.51    | -        | 98.4                            | 98.9     | -        | 7.51          | 7.32     | -        | 75.5                         | 75.5     | -        |
| 24.0           | 4.9              | 5.3      | -        | 12.55                   | 12.48    | -        | 98.1                            | 98.5     | -        | 7.50          | 7.31     | -        | 75.5                         | 75.5     | -        |
| 25.0           | 4.9              | 5.3      | -        | 12.54                   | 12.46    | -        | 98.0                            | 98.3     | -        | 7.49          | 7.31     | -        | 75.5                         | 75.5     | -        |
| 26.0           | 4.9              | -        | -        | 12.52                   | -        | -        | 97.8                            | -        | -        | 7.49          | -        | -        | 75.5                         | -        | -        |
| 27.0           | 4.9              | -        | -        | 12.49                   | -        | -        | 97.5                            | -        | -        | 7.48          | -        | -        | 75.5                         | -        | -        |
| 28.0           | 4.9              | -        | -        | 12.48                   | -        | -        | 97.4                            | -        | -        | 7.48          | -        | -        | 75.5                         | -        | -        |
| 29.0           | 4.8              | -        | -        | 12.44                   | -        | -        | 97.0                            | -        | -        | 7.47          | -        | -        | 75.5                         | -        | -        |
| 30.0           | 4.8              | -        | -        | 12.42                   | -        | -        | 96.8                            | -        | -        | 7.47          | -        | -        | 75.5                         | -        | -        |
| 31.0           | 4.8              | -        | -        | 12.42                   | -        | -        | 96.7                            | -        | -        | 7.47          | -        | -        | 75.5                         | -        | -        |
| 32.0           | 4.8              | -        | -        | 12.41                   | -        | -        | 96.6                            | -        | -        | 7.46          | -        | -        | 75.5                         | -        | -        |
| 33.0           | 4.8              | -        | -        | 12.39                   | -        | -        | 96.4                            | -        | -        | 7.45          | -        | -        | 75.5                         | -        | -        |
| 34.0           | 4.8              | -        | -        | 12.37                   | -        | -        | 96.3                            | -        | -        | 7.45          | -        | -        | 75.5                         | -        | -        |
| 35.0           | 4.7              | -        | -        | 12.35                   | -        | -        | 96.1                            | -        | -        | 7.45          | -        | -        | 75.5                         | -        | -        |
| 36.0           | 4.7              | -        | -        | 12.31                   | -        | -        | 95.8                            | -        | -        | 7.45          | -        | -        | 75.5                         | -        | -        |

Notes: "-" = no data / not applicable. Total depth at stations REF3-03, REF3-02, and REF3-01 was 36.7, 30.3, and 15.4 m, respectively, at the time of summer sampling.

**Table C.6: *In Situ* Water Quality Profile Data Collected at Reference Lake 3 Water Quality Monitoring Stations in Fall 2020, Mary River Project CREMP**

| Depth (m)      | Temperature (°C) |           |           | Dissolved Oxygen (mg/L) |           |           | Dissolved Oxygen (% Saturation) |           |           | pH (pH units) |           |           | Specific Conductance (µS/cm) |           |           |
|----------------|------------------|-----------|-----------|-------------------------|-----------|-----------|---------------------------------|-----------|-----------|---------------|-----------|-----------|------------------------------|-----------|-----------|
|                | REF3-03          | REF3-02   | REF3-01   | REF3-03                 | REF3-02   | REF3-01   | REF3-03                         | REF3-02   | REF3-01   | REF3-03       | REF3-02   | REF3-01   | REF3-03                      | REF3-02   | REF3-01   |
| Date Collected | 29-Aug-20        | 29-Aug-20 | 29-Aug-20 | 29-Aug-20               | 29-Aug-20 | 29-Aug-20 | 29-Aug-20                       | 29-Aug-20 | 29-Aug-20 | 29-Aug-20     | 29-Aug-20 | 29-Aug-20 | 29-Aug-20                    | 29-Aug-20 | 29-Aug-20 |
| 1.0            | 8.9              | 8.8       | 8.6       | 11.56                   | 11.58     | 11.51     | 99.5                            | 99.6      | 98.7      | 7.82          | 7.86      | 7.85      | 76.6                         | 76.8      | 77.5      |
| 2.0            | 8.7              | 8.7       | 8.5       | 11.60                   | 11.57     | 11.56     | 99.6                            | 99.3      | 98.8      | 7.79          | 7.82      | 7.82      | 76.3                         | 76.7      | 76.9      |
| 3.0            | 8.6              | 8.6       | 8.4       | 11.60                   | 11.58     | 11.56     | 99.5                            | 99.3      | 98.7      | 7.78          | 7.82      | 7.81      | 76.3                         | 76.7      | 76.8      |
| 4.0            | 8.6              | 8.6       | 8.4       | 11.61                   | 11.56     | 11.56     | 99.3                            | 99.0      | 98.6      | 7.77          | 7.81      | 7.80      | 76.3                         | 76.6      | 76.8      |
| 5.0            | 8.3              | 8.5       | 8.4       | 11.61                   | 11.58     | 11.56     | 98.8                            | 98.9      | 98.6      | 7.76          | 7.80      | 7.80      | 76.3                         | 76.5      | 76.6      |
| 6.0            | 8.3              | 8.4       | 8.4       | 11.60                   | 11.57     | 11.54     | 98.6                            | 98.7      | 98.4      | 7.77          | 7.79      | 7.79      | 76.3                         | 76.4      | 76.5      |
| 7.0            | 8.2              | 8.4       | 8.3       | 11.59                   | 11.56     | 11.53     | 98.4                            | 98.5      | 98.2      | 7.76          | 7.79      | 7.79      | 76.3                         | 76.4      | 76.5      |
| 8.0            | 8.2              | 8.3       | 8.3       | 11.58                   | 11.54     | 11.53     | 98.3                            | 98.3      | 98.1      | 7.78          | 7.78      | 7.79      | 76.3                         | 76.4      | 76.4      |
| 9.0            | 8.2              | 8.3       | 8.3       | 11.58                   | 11.54     | 11.53     | 98.3                            | 98.2      | 98.1      | 7.77          | 7.78      | 7.78      | 76.3                         | 76.4      | 76.4      |
| 10.0           | 8.2              | 8.3       | 8.3       | 11.58                   | 11.53     | 11.52     | 98.2                            | 98.1      | 97.9      | 7.77          | 7.78      | 7.78      | 76.3                         | 76.4      | 76.5      |
| 11.0           | 8.2              | 8.3       | 8.2       | 11.57                   | 11.52     | 11.52     | 98.2                            | 98.0      | 97.8      | 7.77          | 7.77      | 7.77      | 76.3                         | 76.4      | 76.5      |
| 12.0           | 8.2              | 8.3       | 8.2       | 11.57                   | 11.52     | 11.51     | 98.2                            | 97.9      | 97.7      | 7.77          | 7.77      | 7.77      | 76.3                         | 76.4      | 76.5      |
| 13.0           | 8.2              | 8.3       | 8.2       | 11.56                   | 11.51     | 11.50     | 98.1                            | 97.8      | 97.7      | 7.77          | 7.77      | 7.76      | 76.3                         | 76.4      | 76.4      |
| 14.0           | 8.2              | 8.3       | -         | 11.55                   | 11.53     | -         | 98.0                            | 98.0      | -         | 7.78          | 7.77      | -         | 76.3                         | 76.3      | -         |
| 15.0           | 8.1              | 8.2       | -         | 11.54                   | 11.53     | -         | 97.8                            | 98.0      | -         | 7.77          | 7.77      | -         | 76.3                         | 76.3      | -         |
| 16.0           | 8.1              | 8.2       | -         | 11.54                   | 11.53     | -         | 97.7                            | 97.9      | -         | 7.77          | 7.77      | -         | 76.3                         | 76.3      | -         |
| 17.0           | 8.1              | 8.2       | -         | 11.54                   | 11.52     | -         | 97.7                            | 97.8      | -         | 7.76          | 7.76      | -         | 76.3                         | 76.3      | -         |
| 18.0           | 8.1              | 8.2       | -         | 11.53                   | 11.51     | -         | 97.7                            | 97.7      | -         | 7.76          | 7.76      | -         | 76.3                         | 76.3      | -         |
| 19.0           | 8.1              | 8.1       | -         | 11.52                   | 11.49     | -         | 97.6                            | 97.3      | -         | 7.77          | 7.75      | -         | 76.3                         | 76.3      | -         |
| 20.0           | 8.0              | 8.1       | -         | 11.51                   | 11.47     | -         | 97.3                            | 97.1      | -         | 7.76          | 7.74      | -         | 76.3                         | 76.3      | -         |
| 21.0           | 7.9              | 8.0       | -         | 11.52                   | 11.49     | -         | 97.9                            | 96.9      | -         | 7.75          | 7.73      | -         | 76.3                         | 76.3      | -         |
| 22.0           | 7.0              | 7.6       | -         | 11.64                   | 11.49     | -         | 96.5                            | 96.2      | -         | 7.71          | 7.68      | -         | 76.3                         | 76.3      | -         |
| 23.0           | 6.3              | 7.5       | -         | 11.88                   | 11.47     | -         | 95.7                            | 95.2      | -         | 7.65          | 7.66      | -         | 76.2                         | 76.2      | -         |
| 24.0           | 5.4              | 6.8       | -         | 12.11                   | 11.57     | -         | 95.9                            | 94.0      | -         | 7.57          | 7.60      | -         | 75.7                         | 75.8      | -         |
| 25.0           | 5.1              | 6.0       | -         | 12.16                   | 11.62     | -         | 95.5                            | 93.4      | -         | 7.52          | 7.50      | -         | 75.4                         | 75.9      | -         |
| 26.0           | 5.1              | 5.9       | -         | 12.14                   | 11.53     | -         | 95.3                            | 92.4      | -         | 7.48          | 7.45      | -         | 75.3                         | 75.8      | -         |
| 27.0           | 5.0              | -         | -         | 12.04                   | -         | -         | 94.3                            | -         | -         | 7.43          | -         | -         | 75.5                         | -         | -         |
| 28.0           | 5.0              | -         | -         | 11.98                   | -         | -         | 93.8                            | -         | -         | 7.41          | -         | -         | 75.5                         | -         | -         |
| 29.0           | 4.9              | -         | -         | 11.86                   | -         | -         | 92.8                            | -         | -         | 7.39          | -         | -         | 75.5                         | -         | -         |
| 30.0           | 4.9              | -         | -         | 11.76                   | -         | -         | 92.0                            | -         | -         | 7.37          | -         | -         | 76.6                         | -         | -         |
| 31.0           | 4.9              | -         | -         | 11.62                   | -         | -         | 90.8                            | -         | -         | 7.35          | -         | -         | 75.6                         | -         | -         |
| 32.0           | 4.8              | -         | -         | 11.24                   | -         | -         | 87.7                            | -         | -         | 7.30          | -         | -         | 75.8                         | -         | -         |
| 33.0           | 4.8              | -         | -         | 10.57                   | -         | -         | 82.3                            | -         | -         | 7.23          | -         | -         | 76.1                         | -         | -         |

Notes: "-" = no data / not applicable. Total depth at stations REF3-03, REF3-02, and REF3-01 was 36.7, 30.3, and 15.4 m, respectively, at the time of fall sampling.

**Table C.7: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Reference Lake 3 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Replicate ID | Date Sampled | Station Depth (m) | Secchi Depth (m) | Colour/ Clarity   | Depth sampled | Temperature (°C) | Dissolved Oxygen |          | pH (pH units) | Specific Conductance (µS/cm) |
|--------------|--------------|-------------------|------------------|-------------------|---------------|------------------|------------------|----------|---------------|------------------------------|
|              |              |                   |                  |                   |               |                  | (mg/L)           | (% sat.) |               |                              |
| REF 03-1     | 14-Aug-20    | 10.5              | 8.05             | clear, colourless | surface       | 10.1             | 12.71            | 114.4    | 7.67          | 75.5                         |
|              |              |                   |                  |                   | bottom        | 9.7              | 11.94            | 108.2    | 7.12          | 76.8                         |
| REF 03-2     | 14-Aug-20    | -                 | 7.4              | clear, colourless | surface       | 10.3             | 13.09            | 118.5    | 7.38          | 74.9                         |
|              |              |                   |                  |                   | bottom        | 9.2              | 11.83            | 104.6    | 6.94          | 82.1                         |
| REF 03-3     | 14-Aug-20    | 10.0              | 9.15             | clear, colourless | surface       | 10.1             | 12.59            | 112.6    | 7.41          | 74.9                         |
|              |              |                   |                  |                   | bottom        | 9.4              | 13.00            | 115.0    | 7.56          | 75.2                         |
| REF 03-4     | 14-Aug-20    | 8.5               | 8.12             | clear, colourless | surface       | 10.2             | 13.33            | 120.5    | 7.16          | 74.9                         |
|              |              |                   |                  |                   | bottom        | 9.4              | 13.03            | 115.0    | 7.13          | 74.8                         |
| REF 03-5     | 14-Aug-20    | 11.0              | 7.92             | clear, colourless | surface       | 9.8              | 12.99            | 116.0    | 7.26          | 74.8                         |
|              |              |                   |                  |                   | bottom        | 8.9              | 13.34            | 116.7    | 7.20          | 74.5                         |
| REF 03-6     | 14-Aug-20    | 20.5              | 8.55             | clear, colourless | surface       | 10.2             | 12.46            | 112.4    | 7.20          | 75.1                         |
|              |              |                   |                  |                   | bottom        | 6.1              | 13.73            | 112.0    | 6.94          | 78.1                         |
| REF 03-7     | 14-Aug-20    | 23.0              | 8.10             | clear, colourless | surface       | 10.2             | 12.79            | 115.2    | 7.35          | 75.2                         |
|              |              |                   |                  |                   | bottom        | 5.8              | 12.82            | 103.5    | 6.27          | 76.0                         |
| REF 03-8     | 14-Aug-20    | 19.0              | 9.84             | clear, colourless | surface       | 10.2             | 13.42            | 121.4    | 7.27          | 75.1                         |
|              |              |                   |                  |                   | bottom        | 5.7              | 15.78            | 127.9    | 6.95          | 75.2                         |
| REF 03-9     | 15-Aug-20    | 21.0              | 7.18             | clear, colourless | surface       | 9.6              | 10.92            | 97.3     | 7.13          | 75.0                         |
|              |              |                   |                  |                   | bottom        | 5.6              | 12.93            | 104.2    | 6.53          | 74.0                         |
| REF 03-10    | 15-Aug-20    | 19.5              | 8.29             | clear, colourless | surface       | 9.7              | 10.81            | 96.6     | 6.89          | 75.0                         |
|              |              |                   |                  |                   | bottom        | 5.9              | 12.91            | 105.2    | 6.82          | 74.3                         |

Note: "-" indicates data not collected.

**Table C.8: Statistical Comparison of Bottom *In Situ* Water Quality Between Littoral and Profundal Stations of Reference Lake 3, Mary River Project CREMP, August 2020**

| Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |   |       |                    |                |         |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|---|-------|--------------------|----------------|---------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Station Type       | n | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Secchi Depth (m)                | tequal                        | none           | NO                                    | 0.621   | Littoral           | 5 | 8.1   | 0.6                | 0.3            | 7.4     | 9.2     |
|                                 |                               |                |                                       |         | Profundal          | 5 | 8.4   | 1.0                | 0.4            | 7.2     | 9.8     |
| Temperature (°C)                | tequal                        | none           | YES                                   | 0.001   | Littoral           | 5 | 9.3   | 0.3                | 0.1            | 8.9     | 9.7     |
|                                 |                               |                |                                       |         | Profundal          | 5 | 5.8   | 0.2                | 0.1            | 5.6     | 6.1     |
| Dissolved Oxygen (mg/L)         | tequal                        | log10          | NO                                    | 0.147   | Littoral           | 5 | 12.6  | 0.7                | 0.3            | 11.8    | 13.3    |
|                                 |                               |                |                                       |         | Profundal          | 5 | 13.6  | 1.3                | 0.6            | 12.8    | 15.8    |
| Dissolved Oxygen (% saturation) | tequal                        | none           | NO                                    | 0.801   | Littoral           | 5 | 111.9 | 5.2                | 2.3            | 104.6   | 116.7   |
|                                 |                               |                |                                       |         | Profundal          | 5 | 110.6 | 10.3               | 4.6            | 103.5   | 127.9   |
| pH (units)                      | tequal                        | none           | YES                                   | 0.019   | Littoral           | 5 | 7.19  | 0.23               | 0.10           | 6.94    | 7.56    |
|                                 |                               |                |                                       |         | Profundal          | 5 | 6.70  | 0.30               | 0.13           | 6.27    | 6.95    |
| Specific Conductance (µS/cm)    | M-W                           | rank           | NO                                    | 0.600   | Littoral           | 5 | 76.7  | 3.2                | 1.4            | 74.5    | 82.1    |
|                                 |                               |                |                                       |         | Profundal          | 5 | 75.5  | 1.6                | 0.7            | 74.0    | 78.1    |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).



**Table C.10: Average Relative Percent Difference (RPD) Values between Water Chemistry Samples Taken at the Top and Bottom of the Water Column at Lake Monitoring Stations, Mary River Project CREMP, 2020**

| Parameters                |                                    | Reference Lake |      | Camp Lake |        |      | Sheardown Lake Northwest |        |      | Sheardown Lake Southeast |        |      | Mary Lake North Basin |        |      | Mary Lake South Basin |        |      |
|---------------------------|------------------------------------|----------------|------|-----------|--------|------|--------------------------|--------|------|--------------------------|--------|------|-----------------------|--------|------|-----------------------|--------|------|
|                           |                                    | Summer         | Fall | Winter    | Summer | Fall | Winter                   | Summer | Fall | Winter                   | Summer | Fall | Winter                | Summer | Fall | Winter                | Summer | Fall |
| Conventional <sup>b</sup> | Conductivity (lab)                 | 0.4            | 1.3  | 5.0       | 2.8    | 39   | 5                        | 4      | 0    | 2.7                      | 6.4    | 0.7  | 2.3                   | 29     | 0.5  | 5.9                   | 6.3    | 1.1  |
|                           | pH (lab)                           | 2.8            | 2.0  | 2.4       | 2.0    | 3.7  | 1.5                      | 4.0    | 0.5  | 1.2                      | 5.4    | 0.5  | 2.3                   | 4.4    | 0.4  | 1.2                   | 3.2    | 0.9  |
|                           | Hardness (as CaCO <sub>3</sub> )   | 1.6            | 0.7  | 6.5       | 2.5    | 41   | 5.1                      | 3.3    | 1.5  | 2.1                      | 8.4    | 0.9  | 3.4                   | 27     | 0.6  | 4.0                   | 8.1    | 1.2  |
|                           | Total Suspended Solids (TSS)       | 0              | 0    | 0         | 1.0    | 0    | 0                        | 21     | 0    | 0                        | 0      | 6.0  | 0                     | 0      | 0    | 0                     | 15     | 6.6  |
|                           | Total Dissolved Solids (TDS)       | 15             | 11   | 7.8       | 5.7    | 78   | 2.6                      | 9.3    | 16   | 7.1                      | 9.6    | 17   | 3.4                   | 30     | 3.7  | 11                    | 9.9    | 7.9  |
|                           | Turbidity                          | 15             | 15   | 26        | 9.5    | 29   | 20                       | 24     | 5.8  | 54                       | 39     | 4.0  | 52                    | 36     | 10.0 | 14                    | 31     | 5.6  |
|                           | Alkalinity (as CaCO <sub>3</sub> ) | 9.3            | 3.9  | 5.7       | 2.6    | 32   | 5.6                      | 3.7    | 19   | 2.4                      | 6.6    | 1.1  | 2.3                   | 28     | 2.0  | 5.3                   | 7.6    | 3.0  |
| Nutrients and Organics    | Total Ammonia                      | 0              | 25   | 56        | 1.5    | 13   | 52                       | 3.8    | 24   | 38                       | 38     | 4.8  | 0                     | 68     | 0    | 0                     | 0      | 0    |
|                           | Nitrate                            | 0              | 0    | 70        | 13     | 19   | 13                       | 10     | 12   | 7.4                      | 27     | 13   | 17                    | 46     | 46   | 18                    | 22     | 33   |
|                           | Nitrite                            | 0              | 0    | 0         | 0      | 0    | 0                        | 36     | 0    | 0                        | 26     | 0    | 0                     | 15     | 0    | 0                     | 0      | 0    |
|                           | Total Kjeldahl Nitrogen (TKN)      | 0              | 4.2  | 28        | 8.2    | 2.9  | 12                       | 8.9    | 3.7  | 1.3                      | 13     | 1.3  | 10.0                  | 6.0    | 6.3  | 10                    | 0      | 0    |
|                           | Dissolved Organic Carbon           | 1.9            | 3.7  | 15        | 27     | 31   | 9.8                      | 16     | 3.6  | 13                       | 38     | 13   | 10                    | 31     | 16   | 5.4                   | 17     | 8.3  |
|                           | Total Organic Carbon               | 2.8            | 2.9  | 8.9       | 5.4    | 17   | 5.6                      | 11     | 5.2  | 5.0                      | 8.4    | 3.1  | 6.4                   | 9.5    | 51   | 6.5                   | 11     | 6.8  |
|                           | Total Phosphorus                   | 39             | 4.2  | 39        | 36     | 34   | 84                       | 22     | 38   | 24                       | 27     | 23   | 20                    | 42     | 30   | 1.4                   | 30     | 45   |
|                           | Phenols                            | 0              | 9.2  | 34        | 53     | 23   | 14                       | 10     | 43   | 1.9                      | 36     | 0    | 28                    | 0      | 0    | 8.0                   | 0      | 16   |
| Anions                    | Bromide (Br)                       | 0              | 0    | 0         | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Chloride (Cl)                      | 3.6            | 0.7  | 14        | 2.6    | 34   | 5.3                      | 3.9    | 0.6  | 2.9                      | 5.1    | 1.1  | 2.9                   | 41     | 1.2  | 6.0                   | 9.6    | 4.9  |
|                           | Sulphate (SO <sub>4</sub> )        | 1.3            | 0.5  | 7.0       | 2.9    | 44   | 5.4                      | 7.5    | 0.1  | 4.9                      | 9.9    | 0.7  | 7.6                   | 38     | 1.1  | 6.4                   | 7.3    | 4.4  |
| Total Metals              | Aluminum (Al)                      | 4.2            | 10   | 102       | 16     | 20   | 50                       | 41     | 41   | 42                       | 48     | 10   | 17                    | 40     | 16   | 25                    | 40     | 14   |
|                           | Antimony (Sb)                      | 0              | 0    | 0         | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Arsenic (As)                       | 0              | 0    | 1.9       | 0      | 0    | 0                        | 0      | 1.6  | 1.9                      | 0      | 0    | 6.1                   | 29     | 0    | 0                     | 0      | 1.4  |
|                           | Barium (Ba)                        | 3.8            | 13   | 4.9       | 5.0    | 42   | 5.3                      | 3.2    | 2.1  | 2.9                      | 2.3    | 3.5  | 4.1                   | 25     | 2.4  | 4.7                   | 9.9    | 3.0  |
|                           | Boron (B)                          | 0              | 0    | 0         | 0      | 0    | 5.8                      | 23     | 2.6  | 3.4                      | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Cadmium (Cd)                       | 0              | 0    | 20        | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Calcium (Ca)                       | 2.4            | 2.4  | 7.2       | 3.3    | 41   | 5.7                      | 4.3    | 1.3  | 2.8                      | 6.8    | 1.5  | 2.5                   | 27     | 0.6  | 3.4                   | 6.0    | 0.8  |
|                           | Chromium (Cr)                      | 0              | 0    | 0         | 21     | 0    | 0                        | 15     | 0    | 0                        | 21     | 0    | 0                     | 28     | 0    | 0                     | 0      | 0    |
|                           | Cobalt (Co)                        | 0              | 0    | 0         | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Copper (Cu)                        | 2.3            | 5.3  | 17        | 5.8    | 17   | 11                       | 5.4    | 2.8  | 9.6                      | 4.6    | 12   | 20                    | 18     | 2.7  | 5.4                   | 9.0    | 6.4  |
|                           | Iron (Fe)                          | 0              | 0    | 0         | 36     | 0    | 0                        | 42     | 14   | 0                        | 50     | 5.7  | 12                    | 50     | 0    | 0                     | 29     | 9.1  |
|                           | Lead (Pb)                          | 0              | 0    | 48        | 0      | 0    | 11                       | 0      | 0    | 0                        | 10     | 9.0  | 0                     | 6.1    | 0    | 0                     | 22     | 0    |
|                           | Lithium (Li)                       | 0              | 0    | 6.0       | 4.9    | 3.3  | 8.8                      | 9.0    | 3.2  | 6.4                      | 8.6    | 11   | 6.9                   | 3.2    | 10   | 0                     | 0      | 0    |
|                           | Magnesium (Mg)                     | 2.6            | 1.6  | 4.6       | 1.4    | 41   | 5.0                      | 6.1    | 1.2  | 3.5                      | 4.2    | 1.0  | 1.4                   | 28     | 2.1  | 4.7                   | 9.6    | 2.8  |
|                           | Manganese (Mn)                     | 8.9            | 11   | 58        | 12     | 43   | 39                       | 44     | 38   | 37                       | 54     | 2.2  | 79                    | 47     | 2.9  | 45                    | 35     | 13   |
|                           | Mercury (Hg)                       | 0              | 0    | 0         | 0      | 0    | 2.8                      | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 2.3                   | 5.0    | 0    |
|                           | Molybdenum (Mo)                    | 3.1            | 8.8  | 16        | 8.9    | 35   | 9.0                      | 4.5    | 2.2  | 7.6                      | 10     | 2.3  | 9.8                   | 35     | 0.4  | 6.3                   | 39     | 6.4  |
|                           | Nickel (Ni)                        | 0              | 0    | 18        | 7.6    | 6.3  | 9.0                      | 3.9    | 3.4  | 5.1                      | 9.9    | 2.6  | 5.7                   | 7.6    | 3.9  | 1.7                   | 0      | 0    |
|                           | Potassium (K)                      | 2.3            | 0.7  | 8.1       | 2.8    | 30   | 6.3                      | 4.0    | 1.3  | 4.3                      | 2.6    | 0.5  | 2.4                   | 23     | 0.6  | 5.4                   | 8.3    | 1.8  |
|                           | Selenium (Se)                      | 0              | 0    | 0         | 0.7    | 0    | 0                        | 7.1    | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Silicon (Si)                       | 4.7            | 6.6  | 26        | 2.2    | 25   | 15                       | 4.8    | 2.4  | 16                       | 19     | 4.1  | 16                    | 7.5    | 2.3  | 6.8                   | 9.8    | 4.7  |
|                           | Silver (Ag)                        | 0              | 0    | 0         | 0      | 0    | 0                        | 44     | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Sodium (Na)                        | 2.5            | 1.5  | 12        | 3.6    | 40   | 6.0                      | 6.1    | 1.0  | 3.4                      | 4.4    | 1.3  | 2.6                   | 41     | 1.4  | 4.4                   | 11     | 2.1  |
|                           | Strontium (Sr)                     | 5.2            | 1.1  | 5.7       | 3.9    | 41   | 5.3                      | 4.9    | 0.5  | 2.1                      | 5.5    | 0.8  | 2.8                   | 33     | 3.0  | 6.7                   | 7.6    | 2.0  |
|                           | Thallium (Tl)                      | 0              | 0    | 0         | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Tin (Sn)                           | 0              | 0    | 6.7       | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Titanium (Ti)                      | 0              | 0    | 0         | 27     | 0    | 0                        | 44     | 0    | 0                        | 62     | 0    | 0                     | 66     | 0    | 0                     | 0      | 0    |
|                           | Uranium (U)                        | 8.9            | 8.2  | 11        | 6.5    | 43   | 6.7                      | 7.7    | 1.3  | 3.8                      | 13     | 1.0  | 7.8                   | 53     | 1.6  | 5.8                   | 14     | 2.3  |
|                           | Vanadium (V)                       | 0              | 0    | 0         | 0      | 0    | 0                        | 0      | 0    | 0                        | 0      | 0    | 0                     | 0      | 0    | 0                     | 0      | 0    |
|                           | Zinc (Zn)                          | 0              | 0    | 38        | 32     | 0    | 16                       | 0      | 0    | 20                       | 0      | 0    | 0                     | 0      | 0    | 0                     | 18     | 0    |

Note: Shaded values indicate RDP >30%.



**Table C.11: *In Situ* Water Quality Measurements Collected at Camp Lake Tributary 1 and Tributary 2 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Study Area                       | Station     | Sampling Date | Temperature (°C) | Dissolved Oxygen (mg/L) | Dissolved Oxygen (% Saturation) | pH (pH units) | Specific Conductance (µS/cm) |
|----------------------------------|-------------|---------------|------------------|-------------------------|---------------------------------|---------------|------------------------------|
| Unnamed Reference Creek          | REF-CRK-B1  | 10-Aug-20     | 9.9              | 10.42                   | 95.3                            | 7.71          | 132.4                        |
|                                  | REF-CRK-B2  | 10-Aug-20     | 9.0              | 10.61                   | 94.6                            | 7.58          | 132.8                        |
|                                  | REF-CRK-B3  | 10-Aug-20     | 8.4              | 10.68                   | 93.2                            | 7.48          | 132.8                        |
|                                  | REF-CRK-B4  | 10-Aug-20     | 8.0              | 11.09                   | 96.5                            | 7.50          | 130.8                        |
|                                  | REF-CRK-B5  | 10-Aug-20     | 7.6              | 11.30                   | 98.0                            | 7.57          | 133.0                        |
| Camp Lake Tributary 1 Upstream   | CLT-1-US-B1 | 17-Aug-20     | 7.9              | 10.51                   | 92.0                            | 8.22          | 240.0                        |
|                                  | CLT-1-US B2 | 17-Aug-20     | 7.8              | 10.59                   | 92.5                            | 8.17          | 241.0                        |
|                                  | CLT-1-US-B3 | 17-Aug-20     | 7.8              | 10.72                   | 93.4                            | 8.17          | 243.2                        |
|                                  | CLT-1-US-B4 | 17-Aug-20     | 7.7              | 10.74                   | 93.6                            | 8.17          | 246.6                        |
|                                  | CLT-1-US-B5 | 17-Aug-20     | 8.4              | 10.27                   | 91.3                            | 8.13          | 318.0                        |
| Camp Lake Tributary 1 Downstream | CLT-1-DS-B1 | 8-Aug-20      | 12.4             | 11.67                   | 115.5                           | 8.30          | 292.2                        |
|                                  | CLT-1-DS-B2 | 8-Aug-20      | 12.3             | 11.23                   | 107.3                           | 7.91          | 299.0                        |
|                                  | CLT-1-DS-B3 | 8-Aug-20      | 12.2             | 11.43                   | 109.7                           | 7.96          | 289.0                        |
|                                  | CLT-1-DS-B4 | 8-Aug-20      | 11.9             | 11.55                   | 110.7                           | 8.18          | 289.3                        |
|                                  | CLT-1-DS-B5 | 8-Aug-20      | 11.5             | 11.94                   | 112.8                           | 8.03          | 289.0                        |
| Camp Lake Tributary 2 Upstream   | CLT-2-US-B1 | 9-Aug-20      | 11.1             | 10.90                   | 103.4                           | 8.26          | 307.4                        |
|                                  | CLT-2-US-B2 | 9-Aug-20      | 11.0             | 11.22                   | 103.4                           | 8.09          | 307.7                        |
|                                  | CLT-2-US-B3 | 9-Aug-20      | 10.4             | 11.61                   | 106.9                           | 8.18          | 307.4                        |
|                                  | CLT-2-US-B4 | 9-Aug-20      | 10.2             | 11.69                   | 107.0                           | 8.13          | 287.5                        |
|                                  | CLT-2-US-B5 | 9-Aug-20      | 9.5              | 11.66                   | 105.8                           | 8.20          | 308.1                        |
| Camp Lake Tributary 2 Downstream | CLT-2-DS-B1 | 9-Aug-20      | 8.7              | 12.63                   | 111.5                           | 8.33          | 311.5                        |
|                                  | CLT-2-DS-B2 | 9-Aug-20      | 8.3              | 12.68                   | 110.3                           | 8.10          | 311.2                        |
|                                  | CLT-2-DS-B3 | 9-Aug-20      | 7.8              | 12.91                   | 111.5                           | 8.08          | 309.7                        |
|                                  | CLT-2-DS-B4 | 9-Aug-20      | 6.1              | 13.64                   | 113.0                           | 8.00          | 312.0                        |
|                                  | CLT-2-DS-B5 | 9-Aug-20      | 5.9              | 13.85                   | 115.0                           | 8.03          | 310.0                        |



**Table C.12: *In Situ* Water Quality Summary Statistics for the Camp Lake Tributary Benthic Stations, Mary River Project CREMP, August 2020**

| Metric                          | Study Area                      | Sample Size | Mean  | Standard Deviation | Standard Error | 95% Confidence Interval |             | Minimum | Maximum |
|---------------------------------|---------------------------------|-------------|-------|--------------------|----------------|-------------------------|-------------|---------|---------|
|                                 |                                 |             |       |                    |                | Lower Bound             | Upper Bound |         |         |
| Water Temperature (°C)          | REF-CRK Unnamed Reference Creek | 5           | 8.6   | 0.9                | 0.4            | 7.9                     | 9.2         | 7.6     | 9.9     |
|                                 | CLT1-US North Branch            | 5           | 7.9   | 0.3                | 0.1            | 7.7                     | 8.1         | 7.7     | 8.4     |
|                                 | CLT1-DS Lower Main Stem         | 5           | 12.1  | 0.4                | 0.2            | 11.8                    | 12.3        | 11.5    | 12.4    |
|                                 | CLT2-US Upstream                | 5           | 10.4  | 0.7                | 0.3            | 10.0                    | 10.9        | 9.5     | 11.1    |
|                                 | CLT2-DS Downstream              | 5           | 7.4   | 1.3                | 0.6            | 6.4                     | 8.3         | 5.9     | 8.7     |
| Dissolved Oxygen (mg/L)         | REF-CRK Unnamed Reference Creek | 5           | 10.82 | 0.36               | 0.16           | 10.55                   | 11.09       | 10.42   | 11.30   |
|                                 | CLT1-US North Branch            | 5           | 10.57 | 0.19               | 0.09           | 10.43                   | 10.71       | 10.27   | 10.74   |
|                                 | CLT1-DS Lower Main Stem         | 5           | 11.56 | 0.27               | 0.12           | 11.37                   | 11.76       | 11.23   | 11.94   |
|                                 | CLT2-US Upstream                | 5           | 11.42 | 0.35               | 0.15           | 11.16                   | 11.67       | 10.90   | 11.69   |
|                                 | CLT2-DS Downstream              | 5           | 13.14 | 0.57               | 0.25           | 12.73                   | 13.56       | 12.63   | 13.85   |
| Dissolved Oxygen (% Saturation) | REF-CRK Unnamed Reference Creek | 5           | 95.5  | 1.8                | 0.8            | 94.2                    | 96.9        | 93.2    | 98.0    |
|                                 | CLT1-US North Branch            | 5           | 92.6  | 1.0                | 0.4            | 91.9                    | 93.3        | 91.3    | 93.6    |
|                                 | CLT1-DS Lower Main Stem         | 5           | 111.2 | 3.1                | 1.4            | 108.9                   | 113.5       | 107.3   | 115.5   |
|                                 | CLT2-US Upstream                | 5           | 105.3 | 1.8                | 0.8            | 104.0                   | 106.6       | 103.4   | 107.0   |
|                                 | CLT2-DS Downstream              | 5           | 112.3 | 1.8                | 0.8            | 110.9                   | 113.6       | 110.3   | 115.0   |
| pH (units)                      | REF-CRK Unnamed Reference Creek | 5           | 7.57  | 0.09               | 0.04           | 7.50                    | 7.63        | 7.48    | 7.71    |
|                                 | CLT1-US North Branch            | 5           | 8.17  | 0.03               | 0.01           | 8.15                    | 8.20        | 8.13    | 8.22    |
|                                 | CLT1-DS Lower Main Stem         | 5           | 8.08  | 0.16               | 0.07           | 7.96                    | 8.19        | 7.91    | 8.30    |
|                                 | CLT2-US Upstream                | 5           | 8.17  | 0.07               | 0.03           | 8.12                    | 8.22        | 8.09    | 8.26    |
|                                 | CLT2-DS Downstream              | 5           | 8.11  | 0.13               | 0.06           | 8.01                    | 8.20        | 8.00    | 8.33    |
| Specific Conductance (µS/cm)    | REF-CRK Unnamed Reference Creek | 5           | 132   | 0.9                | 0.4            | 132                     | 133         | 131     | 133     |
|                                 | CLT1-US North Branch            | 5           | 258   | 33.8               | 15.1           | 233                     | 283         | 240     | 318     |
|                                 | CLT1-DS Lower Main Stem         | 5           | 292   | 4.3                | 1.9            | 289                     | 295         | 289     | 299     |
|                                 | CLT2-US Upstream                | 5           | 304   | 9.0                | 4.0            | 297                     | 310         | 288     | 308     |
|                                 | CLT2-DS Downstream              | 5           | 311   | 1.0                | 0.4            | 310                     | 312         | 310     | 312     |

**Table C.13: *In Situ* Water Quality Statistical Comparisons among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                          | Overall 3-group Comparison    |                |                                       |         | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |                      |                                       |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|-----------------------------------------------------|----------------------|---------------------------------------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | (I) Area                                            | (J) Area             | Significant Difference Between Areas? | P-value |
| Water Temperature (°C)          | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT1 North Branch    | NO                                    | 0.215   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT1 Lower Main Stem | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT1 North Branch                                   | CLT1 Lower Main Stem | YES                                   | <0.001  |
| Dissolved Oxygen (mg/L)         | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT1 North Branch    | NO                                    | 0.360   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT1 Lower Main Stem | YES                                   | 0.003   |
|                                 |                               |                |                                       |         | CLT1 North Branch                                   | CLT1 Lower Main Stem | YES                                   | <0.001  |
| Dissolved Oxygen (% saturation) | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT1 North Branch    | NO                                    | 0.117   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT1 Lower Main Stem | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT1 North Branch                                   | CLT1 Lower Main Stem | YES                                   | <0.001  |
| pH (units)                      | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT1 North Branch    | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT1 Lower Main Stem | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT1 North Branch                                   | CLT1 Lower Main Stem | NO                                    | 0.371   |
| Specific Conductance (µS/cm)    | K-W                           | rank           | YES                                   | 0.0050  | REF-CRK Unnamed Reference Creek                     | CLT1 North Branch    | YES                                   | 0.034   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT1 Lower Main Stem | YES                                   | 0.001   |
|                                 |                               |                |                                       |         | CLT1 North Branch                                   | CLT1 Lower Main Stem | NO                                    | 0.288   |

 Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

Table C.14: Water Chemistry at Lotic Camp Lake Tributary (CLT) Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Spring Sampling Event |            |            |            |            |            |            |
|------------------------|------------------------------------|-------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |       |                                            |                             | L1-08                 | L1-02      | L2-03      | L1-09      | L1-05      | L0-01      | K0-01      |
|                        |                                    |       |                                            |                             | 04-Jul-20             | 02-Jul-20  | 02-Jul-20  | 02-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  |
| Conventionals          | Conductivity (lab)                 | µS/cm | -                                          | -                           | 97.5                  | 124        | 258        | 151        | 155        | 160        | 154        |
|                        | pH (lab)                           | pH    | 6.5 - 9.0                                  | -                           | 7.93                  | 8.14       | 8.16       | 8.23       | 8.15       | 8.20       | 8.18       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L  | -                                          | -                           | 44.5                  | 59.9       | 103        | 68.7       | 69.3       | 71.2       | 70.4       |
|                        | Total Suspended Solids (TSS)       | mg/L  | -                                          | -                           | <2.0                  | 2.7        | 9.9        | 2.6        | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L  | -                                          | -                           | 92                    | 80         | 158        | 109        | 118        | 104        | 120        |
|                        | Turbidity                          | NTU   | -                                          | -                           | 1.27                  | 1.15       | 15.8       | 3.17       | 2.07       | 1.68       | 0.55       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L  | -                                          | -                           | 46                    | 59         | 93         | 66         | 70         | 70         | 62         |
| Nutrients and Organics | Total Ammonia                      | mg/L  | -                                          | 0.855                       | <0.010                | <0.010     | 0.064      | 0.011      | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L  | 3                                          | 3                           | 0.081                 | <0.020     | 1.03       | 0.151      | 0.159      | 0.137      | 0.135      |
|                        | Nitrite                            | mg/L  | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | 0.0089     | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L  | -                                          | -                           | 0.081                 | <0.021     | 1.0389     | 0.151      | 0.159      | 0.137      | 0.135      |
|                        | Dissolved Organic Carbon           | mg/L  | -                                          | -                           | 2.27                  | 3.03       | 4.79       | 3.32       | 3.50       | 3.41       | 2.81       |
|                        | Total Organic Carbon               | mg/L  | -                                          | -                           | 2.62                  | 4.38       | 5.87       | 4.78       | 4.57       | 4.68       | 3.86       |
|                        | Total Phosphorus                   | mg/L  | 0.030 <sup>α</sup>                         | -                           | 0.0042                | 0.0032     | 0.0197     | 0.0033     | 0.0184     | <0.0030    | 0.0075     |
|                        | Phenols                            | mg/L  | 0.004 <sup>α</sup>                         | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | 0.0011     | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L  | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L  | 120                                        | 120                         | 1.26                  | 1.57       | 16.4       | 4.33       | 4.47       | 4.41       | 2.38       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L  | 218 <sup>β</sup>                           | 218                         | 2.59                  | 2.55       | 8.22       | 3.50       | 3.36       | 3.57       | 11.8       |
| Total Metals           | Aluminum (Al)                      | mg/L  | 0.100                                      | 0.179                       | 0.0248                | 0.0139     | 0.270      | 0.0560     | 0.0546     | 0.0592     | 0.0229     |
|                        | Antimony (Sb)                      | mg/L  | 0.020 <sup>α</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L  | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | 0.00018    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L  | -                                          | -                           | 0.00691               | 0.00825    | 0.0124     | 0.00884    | 0.00880    | 0.00903    | 0.00856    |
|                        | Beryllium (Be)                     | mg/L  | 0.011 <sup>α</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L  | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L  | 1.5                                        | -                           | <0.010                | <0.010     | 0.017      | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L  | 0.00012                                    | 0.00008                     | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L  | -                                          | -                           | 8.67                  | 11.8       | 20.6       | 13.7       | 14.0       | 14.5       | 13.9       |
|                        | Chromium (Cr)                      | mg/L  | 0.0089                                     | 0.000856                    | <0.00050              | <0.00050   | 0.00059    | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L  | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010              | <0.00010   | 0.00027    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L  | 0.002                                      | 0.0022                      | 0.00221               | 0.00190    | 0.00164    | 0.00192    | 0.00184    | 0.00179    | 0.00116    |
|                        | Iron (Fe)                          | mg/L  | 0.30                                       | 0.326                       | <0.030                | <0.030     | 0.420      | 0.087      | 0.081      | 0.073      | <0.030     |
|                        | Lead (Pb)                          | mg/L  | 0.001                                      | 0.001                       | 0.000056              | <0.000050  | 0.000987   | 0.000116   | 0.000100   | 0.000091   | <0.000050  |
|                        | Lithium (Li)                       | mg/L  | -                                          | -                           | <0.0010               | <0.0010    | 0.0033     | 0.0014     | 0.0015     | 0.0016     | 0.0012     |
|                        | Magnesium (Mg)                     | mg/L  | -                                          | -                           | 5.62                  | 7.23       | 13.1       | 8.42       | 8.78       | 9.19       | 8.91       |
|                        | Manganese (Mn)                     | mg/L  | 0.935 <sup>β</sup>                         | -                           | 0.00104               | 0.000528   | 0.0197     | 0.00381    | 0.00352    | 0.00280    | 0.000933   |
|                        | Mercury (Hg)                       | mg/L  | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L  | 0.073                                      | -                           | 0.000570              | 0.000435   | 0.00199    | 0.000727   | 0.000758   | 0.000710   | 0.000308   |
|                        | Nickel (Ni)                        | mg/L  | 0.025                                      | 0.025                       | <0.00050              | 0.00060    | 0.00711    | 0.00080    | 0.00080    | 0.00085    | 0.00052    |
|                        | Potassium (K)                      | mg/L  | -                                          | -                           | 1.47                  | 1.39       | 2.85       | 1.67       | 1.67       | 1.66       | 1.20       |
|                        | Selenium (Se)                      | mg/L  | 0.001                                      | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L  | -                                          | -                           | 0.66                  | 0.67       | 1.23       | 0.78       | 0.79       | 0.82       | 0.67       |
|                        | Silver (Ag)                        | mg/L  | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L  | -                                          | -                           | 0.470                 | 0.897      | 9.30       | 2.34       | 2.47       | 2.48       | 1.85       |
|                        | Strontium (Sr)                     | mg/L  | -                                          | -                           | 0.00601               | 0.00658    | 0.0202     | 0.0103     | 0.0114     | 0.0113     | 0.00886    |
|                        | Thallium (Tl)                      | mg/L  | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L  | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L  | -                                          | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L  | 0.015                                      | -                           | 0.00111               | 0.000707   | 0.0150     | 0.00268    | 0.00280    | 0.00247    | 0.000625   |
|                        | Vanadium (V)                       | mg/L  | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L  | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | 0.0034     | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake Tributaries.

Table C.14: Water Chemistry at Lotic Camp Lake Tributary (CLT) Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |            |            |            |            |            |            |
|------------------------|------------------------------------|-------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |       |                                            |                             | L1-08                 | L1-02      | L2-03      | L1-09      | L1-05      | L0-01      | K0-01      |
|                        |                                    |       |                                            |                             | 03-Aug-20             | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  |
| Conventionals          | Conductivity (lab)                 | µS/cm | -                                          | -                           | 157                   | 227        | 393        | 274        | 283        | 289        | 300        |
|                        | pH (lab)                           | pH    | 6.5 - 9.0                                  | -                           | 8.03                  | 8.24       | 8.01       | 8.21       | 8.22       | 8.26       | 8.34       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L  | -                                          | -                           | 73                    | 108        | 147        | 121        | 125        | 138        | 147        |
|                        | Total Suspended Solids (TSS)       | mg/L  | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | 2.1        | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L  | -                                          | -                           | 92                    | 109        | 191        | 125        | 129        | 141        | 153        |
|                        | Turbidity                          | NTU   | -                                          | -                           | 0.24                  | 0.14       | 2.38       | 0.81       | 0.84       | 0.71       | 0.20       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L  | -                                          | -                           | 78                    | 110        | 138        | 120        | 120        | 125        | 134        |
| Nutrients and Organics | Total Ammonia                      | mg/L  | -                                          | 0.855                       | <0.010                | <0.010     | 0.024      | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L  | 3                                          | 3                           | 0.127                 | 0.021      | 1.52       | 0.277      | 0.306      | 0.256      | 0.047      |
|                        | Nitrite                            | mg/L  | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | 0.0099     | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L  | -                                          | -                           | <0.15                 | <0.15      | 0.32       | 0.18       | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L  | -                                          | -                           | 2.64                  | 3.37       | 6.01       | 5.27       | 4.35       | 4.67       | 3.88       |
|                        | Total Organic Carbon               | mg/L  | -                                          | -                           | 3.60                  | 4.10       | 7.48       | 5.01       | 5.83       | 5.69       | 4.36       |
|                        | Total Phosphorus                   | mg/L  | 0.030 <sup>α</sup>                         | -                           | <0.0030               | <0.0030    | 0.0093     | <0.0030    | 0.0033     | <0.0030    | <0.0030    |
|                        | Phenols                            | mg/L  | 0.004 <sup>α</sup>                         | -                           | <0.0010               | 0.0015     | 0.0012     | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L  | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L  | 120                                        | 120                         | 2.02                  | 3.99       | 27.7       | 10.4       | 11.2       | 12.1       | 9.11       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L  | 218 <sup>β</sup>                           | 218                         | 5.00                  | 5.34       | 16.4       | 7.51       | 7.87       | 8.54       | 14.9       |
| Total Metals           | Aluminum (Al)                      | mg/L  | 0.100                                      | 0.179                       | 0.0122                | 0.0051     | 0.0495     | 0.0151     | 0.0164     | 0.0147     | 0.0094     |
|                        | Antimony (Sb)                      | mg/L  | 0.020 <sup>α</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L  | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | 0.00015    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L  | -                                          | -                           | 0.0105                | 0.0138     | 0.0151     | 0.0141     | 0.0144     | 0.0156     | 0.0155     |
|                        | Beryllium (Be)                     | mg/L  | 0.011 <sup>α</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L  | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L  | 1.5                                        | -                           | <0.010                | <0.010     | 0.025      | 0.012      | 0.012      | 0.011      | <0.010     |
|                        | Cadmium (Cd)                       | mg/L  | 0.00012                                    | 0.00008                     | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L  | -                                          | -                           | 14.7                  | 20.9       | 29.4       | 24.6       | 24.8       | 26.5       | 27.6       |
|                        | Chromium (Cr)                      | mg/L  | 0.0089                                     | 0.000856                    | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L  | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010              | <0.00010   | 0.00019    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L  | 0.002                                      | 0.0022                      | 0.00226               | 0.00217    | 0.00134    | 0.00190    | 0.00194    | 0.00199    | 0.00159    |
|                        | Iron (Fe)                          | mg/L  | 0.30                                       | 0.326                       | <0.030                | <0.030     | 0.423      | 0.135      | 0.134      | 0.100      | <0.030     |
|                        | Lead (Pb)                          | mg/L  | 0.001                                      | 0.001                       | <0.000050             | <0.000050  | 0.000092   | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L  | -                                          | -                           | <0.0010               | 0.0015     | 0.0042     | 0.0025     | 0.0026     | 0.0027     | 0.0021     |
|                        | Magnesium (Mg)                     | mg/L  | -                                          | -                           | 9.05                  | 13.4       | 19.1       | 15.2       | 15.3       | 16.5       | 16.6       |
|                        | Manganese (Mn)                     | mg/L  | 0.935 <sup>β</sup>                         | -                           | 0.000710              | 0.000556   | 0.0323     | 0.00933    | 0.00890    | 0.00715    | 0.00230    |
|                        | Mercury (Hg)                       | mg/L  | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L  | 0.073                                      | -                           | 0.00143               | 0.000882   | 0.00361    | 0.00138    | 0.00137    | 0.00122    | 0.000594   |
|                        | Nickel (Ni)                        | mg/L  | 0.025                                      | 0.025                       | <0.00050              | 0.00064    | 0.00139    | 0.00092    | 0.00107    | 0.00125    | 0.00074    |
|                        | Potassium (K)                      | mg/L  | -                                          | -                           | 2.38                  | 2.22       | 4.05       | 2.67       | 2.56       | 2.69       | 2.10       |
|                        | Selenium (Se)                      | mg/L  | 0.001                                      | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L  | -                                          | -                           | 0.84                  | 0.99       | 0.94       | 1.08       | 1.11       | 1.18       | 0.86       |
|                        | Silver (Ag)                        | mg/L  | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L  | -                                          | -                           | 0.779                 | 2.27       | 16.0       | 5.85       | 5.70       | 5.92       | 5.68       |
|                        | Strontium (Sr)                     | mg/L  | -                                          | -                           | 0.0111                | 0.0126     | 0.0311     | 0.0221     | 0.0233     | 0.0239     | 0.0195     |
|                        | Thallium (Tl)                      | mg/L  | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L  | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L  | -                                          | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L  | 0.015                                      | -                           | 0.00559               | 0.00348    | 0.0247     | 0.00786    | 0.00751    | 0.00672    | 0.00326    |
|                        | Vanadium (V)                       | mg/L  | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L  | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake Tributaries.

Table C.14: Water Chemistry at Lotic Camp Lake Tributary (CLT) Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Fall Sampling Event |            |            |            |            |            |            |
|------------------------|------------------------------------|-------|--------------------------------------------|-----------------------------|---------------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |       |                                            |                             | LI-08               | L1-02      | L2-03      | L1-09      | L0-05      | L0-01      | K0-01      |
|                        |                                    |       |                                            |                             | 28-Aug-20           | 30-Aug-20  | 29-Aug-20  | 30-Aug-20  | 30-Aug-20  | 29-Aug-20  | 29-Aug-20  |
| Conventionals          | Conductivity (lab)                 | µS/cm | -                                          | -                           | 190                 | 242        | 449        | 288        | 298        | 315        | 345        |
|                        | pH (lab)                           | pH    | 6.5 - 9.0                                  | -                           | 8.08                | 8.20       | 8.11       | 8.17       | 8.18       | 8.33       | 8.43       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L  | -                                          | -                           | 100                 | 125        | 191        | 145        | 149        | 153        | 167        |
|                        | Total Suspended Solids (TSS)       | mg/L  | -                                          | -                           | <2.0                | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L  | -                                          | -                           | 97                  | <10        | 236        | 85         | 81         | 163        | 192        |
|                        | Turbidity                          | NTU   | -                                          | -                           | 0.24                | 0.12       | 2.62       | 1.40       | 0.63       | 0.62       | 0.23       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L  | -                                          | -                           | 88                  | 113        | 156        | 134        | 135        | 130        | 136        |
| Nutrients and Organics | Total Ammonia                      | mg/L  | -                                          | 0.855                       | 0.022               | <0.010     | 0.036      | 0.015      | 0.014      | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L  | 3                                          | 3                           | 0.101               | 0.049      | 1.71       | 0.345      | 0.383      | 0.322      | 0.148      |
|                        | Nitrite                            | mg/L  | 0.06                                       | 0.06                        | <0.0050             | <0.0050    | 0.0124     | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L  | -                                          | -                           | <0.15               | <0.15      | 0.54       | 0.16       | 0.21       | 0.16       | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L  | -                                          | -                           | 2.49                | 2.52       | 8.00       | 3.54       | 3.54       | 4.28       | 3.08       |
|                        | Total Organic Carbon               | mg/L  | -                                          | -                           | 2.70                | 3.02       | 6.86       | 3.94       | 4.07       | 4.22       | 3.50       |
|                        | Total Phosphorus                   | mg/L  | 0.030 <sup>α</sup>                         | -                           | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |
|                        | Phenols                            | mg/L  | 0.004 <sup>α</sup>                         | -                           | <0.0010             | <0.0010    | 0.0018     | 0.0017     | 0.0010     | 0.0012     | 0.0017     |
| Anions                 | Bromide (Br)                       | mg/L  | -                                          | -                           | <0.10               | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L  | 120                                        | 120                         | 3.01                | 6.05       | 34.4       | 14.1       | 14.7       | 15.2       | 13.6       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L  | 218 <sup>β</sup>                           | 218                         | 6.38                | 8.11       | 19.6       | 10.7       | 10.8       | 11.9       | 26.2       |
| Total Metals           | Aluminum (Al)                      | mg/L  | 0.100                                      | 0.179                       | 0.0104              | 0.0055     | 0.0979     | 0.0092     | 0.0117     | 0.0162     | 0.0089     |
|                        | Antimony (Sb)                      | mg/L  | 0.020 <sup>α</sup>                         | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L  | 0.005                                      | 0.005                       | <0.00010            | <0.00010   | 0.00014    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L  | -                                          | -                           | 0.0122              | 0.0151     | 0.0180     | 0.0160     | 0.0162     | 0.0164     | 0.0184     |
|                        | Beryllium (Be)                     | mg/L  | 0.011 <sup>α</sup>                         | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L  | -                                          | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L  | 1.5                                        | -                           | <0.010              | <0.010     | 0.023      | 0.012      | 0.012      | 0.012      | <0.010     |
|                        | Cadmium (Cd)                       | mg/L  | 0.00012                                    | 0.00008                     | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L  | -                                          | -                           | 19.3                | 24.3       | 35.7       | 28.0       | 27.7       | 28.6       | 31.8       |
|                        | Chromium (Cr)                      | mg/L  | 0.0089                                     | 0.000856                    | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L  | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010            | <0.00010   | 0.00024    | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L  | 0.002                                      | 0.0022                      | 0.00216             | 0.00216    | 0.00159    | 0.00199    | 0.00200    | 0.00189    | 0.00152    |
|                        | Iron (Fe)                          | mg/L  | 0.30                                       | 0.326                       | <0.030              | <0.030     | 0.522      | 0.111      | 0.104      | 0.084      | <0.030     |
|                        | Lead (Pb)                          | mg/L  | 0.001                                      | 0.001                       | <0.000050           | <0.000050  | 0.000222   | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L  | -                                          | -                           | <0.0010             | 0.0015     | 0.0042     | 0.0024     | 0.0025     | 0.0028     | 0.0019     |
|                        | Magnesium (Mg)                     | mg/L  | -                                          | -                           | 12.1                | 15.7       | 24.2       | 18.0       | 18.2       | 18.4       | 20.3       |
|                        | Manganese (Mn)                     | mg/L  | 0.935 <sup>β</sup>                         | -                           | 0.000673            | 0.000554   | 0.0382     | 0.00920    | 0.00774    | 0.00603    | 0.000767   |
|                        | Mercury (Hg)                       | mg/L  | 0.000026                                   | -                           | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L  | 0.073                                      | -                           | 0.00152             | 0.00102    | 0.00385    | 0.00154    | 0.00149    | 0.00141    | 0.000734   |
|                        | Nickel (Ni)                        | mg/L  | 0.025                                      | 0.025                       | <0.00050            | 0.00063    | 0.00165    | 0.00089    | 0.00106    | 0.00106    | 0.00065    |
|                        | Potassium (K)                      | mg/L  | -                                          | -                           | 2.60                | 2.52       | 4.40       | 2.81       | 2.79       | 2.79       | 2.45       |
|                        | Selenium (Se)                      | mg/L  | 0.001                                      | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L  | -                                          | -                           | 0.93                | 0.98       | 1.08       | 1.05       | 1.11       | 1.16       | 0.72       |
|                        | Silver (Ag)                        | mg/L  | 0.00025                                    | 0.0001                      | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L  | -                                          | -                           | 0.885               | 2.80       | 19.0       | 6.93       | 6.98       | 7.09       | 7.36       |
|                        | Strontium (Sr)                     | mg/L  | -                                          | -                           | 0.0147              | 0.0146     | 0.0385     | 0.0268     | 0.0273     | 0.0271     | 0.0221     |
|                        | Thallium (Tl)                      | mg/L  | 0.0008                                     | 0.0008                      | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L  | -                                          | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L  | -                                          | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L  | 0.015                                      | -                           | 0.00972             | 0.00589    | 0.0332     | 0.0110     | 0.0103     | 0.00935    | 0.00460    |
|                        | Vanadium (V)                       | mg/L  | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L  | 0.030                                      | 0.030                       | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**

 Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Camp Lake Tributaries.

**Table C.15: Magnitude of Elevation in Seasonal Average Water Chemistry (Total Metal Concentration Data Provided) Between the Camp Lake Tributaries and Average Reference Creek Stations, Mary River Project CREMP, 2020**

| Parameter                          | Spring       |                       |                 |               | Summer       |                       |                 |               | Fall         |                       |                 |               |
|------------------------------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|
|                                    | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          |
|                                    | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 |
| Conductivity (lab)                 | 2.0          | 4.7                   | 2.8             | 2.8           | 1.4          | 2.9                   | 2.1             | 2.2           | 1.2          | 2.6                   | 1.7             | 2.0           |
| Hardness (as CaCO <sub>3</sub> )   | 2.2          | 4.4                   | 3.0             | 3.0           | 1.6          | 2.6                   | 2.2             | 2.6           | 1.4          | 2.3                   | 1.8             | 2.0           |
| Total Suspended Solids (TSS)       | 0.7          | 3.1                   | 0.7             | 0.6           | 0.7          | 0.7                   | 0.8             | 0.7           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Total Dissolved Solids (TDS)       | 1.0          | 1.9                   | 1.3             | 1.4           | 1.2          | 2.3                   | 1.6             | 1.8           | 0.5          | 2.4                   | 1.1             | 1.9           |
| Turbidity                          | 0.6          | 8.4                   | 1.2             | 0.3           | 0.0          | 0.4                   | 0.1             | 0.0           | 0.1          | 1.1                   | 0.4             | 0.1           |
| Alkalinity (as CaCO <sub>3</sub> ) | 2.2          | 3.9                   | 2.9             | 2.6           | 1.5          | 2.3                   | 2.0             | 2.2           | 1.5          | 2.3                   | 1.9             | 2.0           |
| Total Ammonia                      | 1.0          | 6.4                   | 1.0             | 1.0           | 0.8          | 2.0                   | 0.8             | 0.8           | 1.6          | 3.6                   | 1.3             | 1.0           |
| Nitrate                            | 2.5          | 52                    | 7.5             | 6.8           | 1.2          | 25                    | 4.5             | 0.8           | 1.0          | 23                    | 4.6             | 2.0           |
| Nitrite                            | 1.0          | 1.8                   | 1.0             | 1.0           | 1.0          | 2.0                   | 1.0             | 1.0           | 1.0          | 2.5                   | 1.0             | 1.0           |
| Total Kjeldahl Nitrogen (TKN)      | 2.4          | 49                    | 7.1             | 6.4           | 1.0          | 2.1                   | 1.1             | 1.0           | 1.0          | 3.6                   | 1.2             | 1.0           |
| Dissolved Organic Carbon           | 1.4          | 2.5                   | 1.8             | 1.5           | 0.9          | 1.7                   | 1.4             | 1.1           | 1.1          | 3.5                   | 1.6             | 1.3           |
| Total Organic Carbon               | 1.6          | 2.6                   | 2.1             | 1.7           | 1.3          | 2.5                   | 1.8             | 1.4           | 1.3          | 3.2                   | 1.9             | 1.6           |
| Total Phosphorus                   | 0.8          | 4.4                   | 1.8             | 1.7           | 0.5          | 1.4                   | 0.5             | 0.5           | 0.8          | 0.8                   | 0.8             | 0.8           |
| Phenols                            | 1.0          | 1.0                   | 1.0             | 1.0           | 1.3          | 1.2                   | 1.0             | 1.0           | 0.5          | 0.9                   | 0.6             | 0.8           |
| Bromide (Br)                       | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Chloride (Cl)                      | 1.2          | 13                    | 3.6             | 2.0           | 0.7          | 6.8                   | 2.8             | 2.2           | 0.6          | 4.9                   | 2.1             | 1.9           |
| Sulphate (SO <sub>4</sub> )        | 2.0          | 6.3                   | 2.7             | 9.0           | 0.9          | 3.0                   | 1.4             | 2.7           | 0.8          | 2.1                   | 1.2             | 2.8           |
| Aluminum (Al)                      | 0.2          | 3.5                   | 0.7             | 0.3           | 0.0          | 0.2                   | 0.0             | 0.0           | 0.1          | 1.7                   | 0.2             | 0.2           |
| Antimony (Sb)                      | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Arsenic (As)                       | 1.0          | 1.8                   | 1.0             | 1.0           | 0.8          | 1.2                   | 0.8             | 0.8           | 1.0          | 1.4                   | 1.0             | 1.0           |
| Barium (Ba)                        | 2.1          | 3.4                   | 2.5             | 2.4           | 1.3          | 1.6                   | 1.6             | 1.6           | 1.3          | 1.7                   | 1.6             | 1.8           |
| Beryllium (Be)                     | 1.0          | 1.0                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Boron (B)                          | 1.0          | 1.7                   | 1.0             | 1.0           | 1.0          | 2.5                   | 1.2             | 1.0           | 1.0          | 2.3                   | 1.2             | 1.0           |
| Cadmium (Cd)                       | 1.0          | 1.0                   | 1.0             | 1.0           | 1.1          | 1.1                   | 1.1             | 1.1           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Calcium (Ca)                       | 2.1          | 4.2                   | 2.9             | 2.9           | 1.5          | 2.5                   | 2.1             | 2.3           | 1.3          | 2.2                   | 1.7             | 1.9           |
| Chromium (Cr)                      | 1.0          | 1.2                   | 1.0             | 1.0           | 0.6          | 0.6                   | 0.6             | 0.6           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Cobalt (Co)                        | 1.0          | 2.7                   | 1.0             | 1.0           | 0.6          | 1.2                   | 0.6             | 0.6           | 1.0          | 2.4                   | 1.0             | 1.0           |
| Copper (Cu)                        | 2.9          | 2.3                   | 2.6             | 1.6           | 1.9          | 1.2                   | 1.7             | 1.4           | 2.1          | 1.6                   | 1.9             | 1.5           |
| Iron (Fe)                          | 0.4          | 5.5                   | 1.0             | 0.4           | 0.1          | 1.7                   | 0.5             | 0.1           | 0.5          | 7.9                   | 1.5             | 0.5           |
| Lead (Pb)                          | 0.5          | 9.2                   | 1.0             | 0.5           | 0.2          | 0.4                   | 0.2             | 0.2           | 0.5          | 2.4                   | 0.5             | 0.5           |
| Lithium (Li)                       | 1.0          | 3.3                   | 1.5             | 1.2           | 1.2          | 3.9                   | 2.4             | 2.0           | 1.3          | 4.2                   | 2.6             | 1.9           |
| Magnesium (Mg)                     | 2.2          | 4.6                   | 3.1             | 3.1           | 1.7          | 2.9                   | 2.3             | 2.5           | 1.5          | 2.5                   | 1.9             | 2.1           |
| Manganese (Mn)                     | 0.6          | 15                    | 2.5             | 0.7           | 0.2          | 11                    | 2.8             | 0.8           | 0.6          | 38                    | 7.5             | 0.8           |
| Mercury (Hg)                       | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Molybdenum (Mo)                    | 3.4          | 13                    | 4.9             | 2.1           | 2.5          | 7.9                   | 2.9             | 1.3           | 2.2          | 6.7                   | 2.6             | 1.3           |
| Nickel (Ni)                        | 1.1          | 14                    | 1.6             | 1.0           | 0.8          | 2.0                   | 1.6             | 1.1           | 1.0          | 2.9                   | 1.8             | 1.2           |
| Potassium (K)                      | 3.2          | 6.3                   | 3.7             | 2.7           | 2.5          | 4.4                   | 2.8             | 2.3           | 2.5          | 4.2                   | 2.7             | 2.4           |
| Selenium (Se)                      | 1.0          | 1.0                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Silicon (Si)                       | 1.1          | 2.0                   | 1.3             | 1.1           | 0.7          | 0.8                   | 0.9             | 0.7           | 1.1          | 1.2                   | 1.3             | 0.8           |
| Silver (Ag)                        | 1.0          | 1.0                   | 1.0             | 1.0           | 0.5          | 0.5                   | 0.5             | 0.5           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Sodium (Na)                        | 0.8          | 11                    | 2.9             | 2.2           | 0.6          | 5.8                   | 2.1             | 2.1           | 0.5          | 4.8                   | 1.8             | 1.9           |
| Strontium (Sr)                     | 1.3          | 4.1                   | 2.3             | 1.8           | 0.9          | 2.2                   | 1.7             | 1.4           | 0.8          | 2.1                   | 1.5             | 1.2           |
| Thallium (Tl)                      | 1.0          | 1.0                   | 1.0             | 1.0           | 1.2          | 1.2                   | 1.2             | 1.2           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Tin (Sn)                           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Titanium (Ti)                      | 0.9          | 0.9                   | 0.9             | 0.9           | 0.4          | 0.4                   | 0.4             | 0.4           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Uranium (U)                        | 2.0          | 34                    | 6.0             | 1.4           | 1.1          | 6.1                   | 1.8             | 0.8           | 1.1          | 4.5                   | 1.4             | 0.6           |
| Vanadium (V)                       | 1.0          | 1.0                   | 1.0             | 1.0           | 0.9          | 0.9                   | 0.9             | 0.9           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Zinc (Zn)                          | 1.0          | 1.1                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Denotes differences in method detection limit between the indicated study area and that of the reference creeks, precluding an evaluation of magnitude of elevation.





**Table C.17: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between the Camp Lake Tributaries and Average Reference Creek Stations, Mary River Project CREMP, 2020**

| Parameter       | Spring       |                       |                 |               | Summer       |                       |                 |               | Fall         |                       |                 |               |
|-----------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|
|                 | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          |
|                 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 |
| Aluminum (Al)   | 0.5          | 0.6                   | 0.5             | 0.5           | 0.1          | 0.3                   | 0.1             | 0.1           | 0.2          | 0.4                   | 0.2             | 1.6           |
| Antimony (Sb)   | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Arsenic (As)    | 1.0          | 1.1                   | 1.0             | 1.0           | 1.0          | 1.3                   | 1.0             | 1.0           | 1.0          | 1.3                   | 1.0             | 1.0           |
| Barium (Ba)     | 2.3          | 1.3                   | 2.7             | 2.7           | 1.5          | 1.9                   | 2.0             | 2.2           | 1.4          | 1.7                   | 1.6             | 1.9           |
| Beryllium (Be)  | 1.0          | 1.3                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Bismuth (Bi)    | 1.0          | 1.3                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Boron (B)       | 1.0          | 1.6                   | 1.0             | 1.0           | 1.0          | 2.3                   | 1.2             | 1.0           | 1.0          | 2.2                   | 1.2             | 1.0           |
| Cadmium (Cd)    | 1.0          | 1.1                   | 1.0             | 1.0           | 1.1          | 1.1                   | 1.1             | 1.1           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Calcium (Ca)    | 2.1          | 1.7                   | 2.9             | 2.9           | 1.5          | 2.4                   | 2.2             | 2.4           | 1.3          | 2.2                   | 1.7             | 1.9           |
| Chromium (Cr)   | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Cobalt (Co)     | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.6                   | 1.0             | 1.0           | 1.0          | 1.9                   | 1.0             | 1.0           |
| Copper (Cu)     | 3.3          | 1.3                   | 2.8             | 1.9           | 2.4          | 1.3                   | 2.2             | 1.9           | 2.3          | 1.6                   | 2.0             | 1.7           |
| Iron (Fe)       | 1.0          | 1.6                   | 1.0             | 1.0           | 0.8          | 6.4                   | 2.0             | 0.8           | 1.0          | 7.4                   | 1.6             | 1.0           |
| Lead (Pb)       | 1.0          | 1.9                   | 1.0             | 1.0           | 0.9          | 0.9                   | 0.9             | 0.9           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Lithium (Li)    | 1.0          | 2.6                   | 1.3             | 1.1           | 1.2          | 3.6                   | 2.6             | 2.2           | 1.1          | 4.3                   | 2.6             | 2.2           |
| Magnesium (Mg)  | 2.3          | 1.9                   | 3.1             | 3.1           | 1.7          | 2.8                   | 2.5             | 2.8           | 1.4          | 2.4                   | 1.9             | 2.1           |
| Manganese (Mn)  | 1.1          | 25                    | 5.4             | 1.3           | 0.9          | 59                    | 13              | 4.1           | 0.9          | 66                    | 11              | 1.3           |
| Mercury (Hg)    | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Molybdenum (Mo) | 3.4          | 5.1                   | 4.9             | 2.0           | 2.3          | 6.8                   | 2.8             | 1.4           | 2.2          | 6.4                   | 2.4             | 1.2           |
| Nickel (Ni)     | 1.1          | 2.0                   | 1.5             | 1.0           | 1.1          | 2.3                   | 2.2             | 1.5           | 1.0          | 2.5                   | 1.8             | 1.2           |
| Potassium (K)   | 3.4          | 3.2                   | 3.8             | 2.9           | 2.8          | 4.7                   | 3.0             | 2.6           | 2.5          | 4.3                   | 2.7             | 2.4           |
| Selenium (Se)   | 1.0          | 1.3                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Silicon (Si)    | 1.3          | 1.0                   | 1.4             | 1.3           | 1.1          | 1.1                   | 1.3             | 1.0           | 1.1          | 1.1                   | 1.3             | 0.9           |
| Silver (Ag)     | 1.0          | 0.5                   | 1.0             | 1.0           | 0.5          | 0.5                   | 0.5             | 0.5           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Sodium (Na)     | 0.9          | 3.2                   | 3.0             | 2.2           | 0.5          | 5.6                   | 2.1             | 2.2           | 0.5          | 4.8                   | 1.8             | 1.9           |
| Strontium (Sr)  | 1.3          | 1.4                   | 2.3             | 1.8           | 0.9          | 2.1                   | 1.7             | 1.4           | 0.8          | 2.0                   | 1.4             | 1.2           |
| Thallium (Tl)   | 1.0          | 1.3                   | 1.0             | 1.0           | 1.3          | 1.3                   | 1.3             | 1.3           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Tin (Sn)        | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Titanium (Ti)   | 1.0          | 1.2                   | 1.0             | 1.0           | 1.2          | 1.2                   | 1.2             | 1.2           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Uranium (U)     | 2.5          | 3.6                   | 6.8             | 1.7           | 1.1          | 5.7                   | 1.7             | 0.8           | 1.1          | 4.7                   | 1.4             | 0.6           |
| Vanadium (V)    | 1.0          | 1.1                   | 1.0             | 1.0           | 1.1          | 1.1                   | 1.1             | 1.1           | 1.0          | 1.0                   | 1.0             | 1.0           |
| Zinc (Zn)       | 1.0          | 1.2                   | 1.0             | 1.0           | 1.2          | 1.2                   | 1.2             | 1.2           | 1.0          | 1.0                   | 1.0             | 1.0           |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Denotes differences in method detection limit between the indicated study area and that of the reference creeks, precluding an evaluation of magnitude of elevation.



**Table C.18: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations at the Camp Lake Tributaries between 2020 and Mine Baseline (2005 to 2013) Periods**

| Variable        | Spring       |                       |                 |               | Summer       |                       |                 |               | Fall         |                       |                 |               |
|-----------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|--------------|-----------------------|-----------------|---------------|
|                 | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          | CLT1         |                       |                 | CLT2          |
|                 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 | North Branch | Upper Main Stem L2-03 | Lower Main Stem | Station KO-01 |
| Aluminum (Al)   | 1.2          | 7.2                   | 1.4             | 1.6           | 1.0          | 1.7                   | 1.1             | 0.7           | 1.2          | 3.0                   | 1.2             | 8.4           |
| Antimony (Sb)   | 0.5          | 1.0                   | 1.0             | 0.6           | 0.7          | 1.0                   | 1.0             | 0.6           | 0.7          | 1.0                   | 1.0             | 0.6           |
| Arsenic (As)    | 1.0          | 1.1                   | 1.0             | 1.0           | 1.0          | 1.3                   | 1.0             | 1.0           | 1.0          | 1.3                   | 1.0             | 1.0           |
| Barium (Ba)     | 2.4          | 2.3                   | 2.2             | 1.6           | 1.7          | 1.6                   | 1.7             | 2.1           | 1.4          | 1.0                   | 1.1             | 1.8           |
| Beryllium (Be)  | 0.3          | 5.0                   | 5.0             | 0.4           | 0.5          | 2.1                   | 2.1             | 0.4           | 0.5          | 2.1                   | 2.1             | 0.4           |
| Bismuth (Bi)    | 1.1          | 1.0                   | 1.0             | 1.1           | 1.1          | 1.0                   | 1.0             | 1.1           | 1.1          | 1.0                   | 1.0             | 1.1           |
| Boron (B)       | 0.5          | 1.6                   | 1.0             | 0.6           | 0.6          | 2.3                   | 1.2             | 1.0           | 1.0          | 2.2                   | 1.1             | 1.0           |
| Cadmium (Cd)    | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 1.0           | 1.0          | 1.0                   | 1.0             | 0.9           |
| Calcium (Ca)    | 2.4          | 1.7                   | 2.0             | 1.9           | 1.8          | 1.3                   | 1.8             | 2.1           | 1.3          | 0.8                   | 1.0             | 1.5           |
| Chromium (Cr)   | -            | -                     | -               | -             | -            | -                     | -               | 0.5           | -            | -                     | -               | -             |
| Cobalt (Co)     | 0.6          | 1.0                   | 1.0             | 0.6           | 0.8          | 1.5                   | 1.0             | 0.6           | 0.8          | 1.8                   | 1.0             | 0.6           |
| Copper (Cu)     | 2.1          | 1.8                   | 1.8             | 1.5           | 1.3          | 1.4                   | 1.2             | 1.7           | 1.3          | 2.1                   | 1.1             | 0.7           |
| Iron (Fe)       | 1.2          | 1.7                   | 1.2             | 1.1           | 1.6          | 1.2                   | 2.6             | 1.4           | 1.8          | 2.1                   | 1.3             | 1.4           |
| Lead (Pb)       | 0.5          | 2.2                   | 1.0             | 0.6           | 0.7          | 1.0                   | 1.0             | 0.6           | 0.7          | 1.0                   | 1.0             | 0.6           |
| Lithium (Li)    | 0.7          | 2.8                   | 2.5             | 0.5           | 0.5          | 1.2                   | 1.1             | 1.0           | 0.5          | 0.7                   | 0.7             | 0.7           |
| Magnesium (Mg)  | 2.4          | 1.9                   | 2.1             | 1.9           | 1.8          | 1.6                   | 1.9             | 2.3           | 1.4          | 1.2                   | 1.3             | 1.6           |
| Manganese (Mn)  | 0.4          | 4.6                   | 0.8             | 0.1           | 1.5          | 2.4                   | 3.4             | 3.1           | 1.1          | 2.3                   | 1.5             | 0.5           |
| Mercury (Hg)    | 0.5          | 0.5                   | 0.5             | 0.5           | 0.5          | 0.5                   | 0.5             | 0.5           | 0.5          | 0.5                   | 0.5             | 0.0           |
| Molybdenum (Mo) | 2.9          | 17                    | 5.2             | 2.1           | 2.9          | 16                    | 3.2             | 2.4           | 1.9          | 15                    | 2.4             | 1.7           |
| Nickel (Ni)     | 0.8          | 1.4                   | 1.0             | 0.2           | 1.0          | 1.2                   | 1.9             | 0.4           | 0.9          | 1.1                   | 1.1             | 0.4           |
| Potassium (K)   | 2.3          | 3.4                   | 2.3             | 2.0           | 1.9          | 4.1                   | 2.0             | 2.3           | 1.5          | 3.0                   | 1.6             | 1.9           |
| Selenium (Se)   | -            | -                     | -               | -             | -            | -                     | -               | -             | -            | -                     | -               | 0.0           |
| Silicon (Si)    | 1.7          | 1.4                   | 1.7             | 1.4           | 1.6          | 1.0                   | 1.7             | 1.4           | 1.3          | 0.7                   | 1.1             | 1.2           |
| Silver (Ag)     | 0.3          | -                     | -               | 0.2           | 0.5          | -                     | -               | 0.2           | 0.6          | -                     | -               | 0.2           |
| Sodium (Na)     | 2.0          | 8.9                   | 4.0             | 4.8           | 2.4          | 8.8                   | 5.2             | 5.6           | 1.9          | 5.9                   | 3.2             | 4.4           |
| Strontium (Sr)  | 2.8          | 1.5                   | 1.9             | 2.5           | 2.3          | 0.9                   | 1.8             | 2.6           | 1.8          | 0.3                   | 0.5             | 1.9           |
| Thallium (Tl)   | 1.3          | -                     | -               | 1.3           | 1.4          | 2.5                   | 2.4             | 1.2           | 1.6          | 2.5                   | 2.5             | 0.2           |
| Tin (Sn)        | 0.3          | 1.0                   | 1.0             | 0.0           | 0.4          | 1.0                   | 1.0             | 0.0           | 0.4          | 1.0                   | 1.0             | 0.0           |
| Titanium (Ti)   | 1.3          | 1.0                   | 1.0             | 1.2           | 1.1          | 1.0                   | 1.0             | 1.2           | 1.1          | 1.0                   | 1.0             | 1.5           |
| Uranium (U)     | 5.9          | 66                    | 15              | 4.4           | 7.7          | 40                    | 9.7             | 4.8           | 3.1          | 21                    | 3.9             | 2.6           |
| Vanadium (V)    | 1.0          | 1.0                   | 1.0             | 1.0           | 0.8          | 1.0                   | 1.0             | 0.9           | 0.9          | 1.0                   | 1.0             | 0.6           |
| Zinc (Zn)       | 2.1          | 2.1                   | 1.5             | 1.9           | 2.2          | 1.7                   | 1.2             | 1.2           | 2.2          | 1.6                   | 2.1             | 2.4           |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference value).

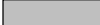
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference value).

Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference value).

Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.

**Table C.19: *In Situ* Water Quality Statistical Comparisons among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                          | Overall 3-group Comparison    |                |                                       |         | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |                 |                                       |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|-----------------------------------------------------|-----------------|---------------------------------------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | (I) Area                                            | (J) Area        | Significant Difference Between Areas? | P-value |
| Water Temperature (°C)          | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT2 Upstream   | YES                                   | 0.028   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT2 Downstream | NO                                    | 0.163   |
|                                 |                               |                |                                       |         | CLT2 Upstream                                       | CLT2 Downstream | YES                                   | <0.001  |
| Dissolved Oxygen (mg/L)         | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT2 Upstream   | NO                                    | 0.119   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT2 Downstream | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT2 Upstream                                       | CLT2 Downstream | YES                                   | <0.001  |
| Dissolved Oxygen (% saturation) | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT2 Upstream   | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT2 Downstream | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT2 Upstream                                       | CLT2 Downstream | YES                                   | <0.001  |
| pH (units)                      | ANOVA                         | none           | YES                                   | < 0.001 | REF-CRK Unnamed Reference Creek                     | CLT2 Upstream   | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT2 Downstream | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT2 Upstream                                       | CLT2 Downstream | NO                                    | 0.578   |
| Specific Conductance (µS/cm)    | K-W                           | rank           | YES                                   | 0.0020  | REF-CRK Unnamed Reference Creek                     | CLT2 Upstream   | YES                                   | 0.077   |
|                                 |                               |                |                                       |         | REF-CRK Unnamed Reference Creek                     | CLT2 Downstream | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | CLT2 Upstream                                       | CLT2 Downstream | YES                                   | 0.077   |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

Table C.20: *In Situ* Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020

| Depth<br>(m)      | Temperature (°C) |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           | pH (pH units) |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|
|                   | JLO-02           | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                  | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                          | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02        | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                       | JLO-10    | JLO-01    | JLO-07    | JLO-09    |
| Date<br>Collected | 12-Apr-20        | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | 12-Apr-20               | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | 12-Apr-20                       | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | 12-Apr-20     | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | 12-Apr-20                    | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 |
| 1.0               | 0.0              | 1.1       | 0.4       | 0.0       | 0.3       | 15.30                   | 14.77     | 14.66     | 14.51     | 14.51     | 104.6                           | 104.6     | 101.7     | 99.4      | 102.6     | 7.85          | 7.82      | 8.02      | 7.97      | 7.96      | 192.1                        | 186.1     | 187.3     | 171.6     | 188.4     |
| 2.0               | 0.0              | 0.2       | 0.1       | 0.1       | 0.1       | 14.92                   | 15.03     | 14.77     | 14.46     | 14.75     | 102.4                           | 103.5     | 101.5     | 99.5      | 101.5     | 7.70          | 7.81      | 7.97      | 7.93      | 7.88      | 184.8                        | 185.1     | 182.2     | 176.7     | 183.2     |
| 3.0               | 0.2              | 0.3       | 0.3       | 0.3       | 0.2       | 14.78                   | 14.86     | 14.56     | 14.27     | 14.60     | 101.8                           | 102.5     | 100.5     | 98.6      | 100.8     | 7.76          | 7.80      | 7.93      | 7.92      | 7.86      | 183.0                        | 181.9     | 179.2     | 174.5     | 179.8     |
| 4.0               | 0.3              | 0.3       | 0.3       | 0.4       | 0.3       | 14.68                   | 14.71     | 14.45     | 14.16     | 14.46     | 101.3                           | 101.6     | 99.9      | 98.0      | 100.0     | 7.74          | 7.79      | 7.91      | 7.91      | 7.86      | 182.2                        | 180.6     | 178.1     | 173.6     | 178.6     |
| 5.0               | 0.4              | 0.4       | 0.4       | 0.4       | 0.4       | 14.52                   | 14.62     | 14.38     | 14.06     | 14.33     | 100.4                           | 101.0     | 99.4      | 97.5      | 99.2      | 7.73          | 7.77      | 7.90      | 7.92      | 7.84      | 180.9                        | 179.7     | 177.4     | 172.7     | 177.2     |
| 6.0               | 0.4              | 0.4       | 0.4       | 0.5       | 0.4       | 14.42                   | 14.56     | 14.28     | 13.92     | 14.17     | 99.8                            | 100.8     | 98.9      | 96.6      | 98.2      | 7.72          | 7.76      | 7.89      | 7.90      | 7.83      | 180.0                        | 179.1     | 176.7     | 171.5     | 175.9     |
| 7.0               | 0.4              | 0.4       | 0.5       | 0.6       | 0.5       | 14.34                   | 14.49     | 14.13     | 13.83     | 14.05     | 99.3                            | 100.4     | 98.1      | 96.2      | 97.6      | 7.71          | 7.75      | 7.89      | 7.91      | 7.83      | 179.1                        | 178.4     | 175.6     | 170.7     | 175.2     |
| 8.0               | 0.5              | 0.5       | 0.5       | 0.6       | 0.5       | 14.20                   | 14.40     | 14.00     | 13.68     | 13.90     | 98.5                            | 99.9      | 97.2      | 95.3      | 96.7      | 7.70          | 7.74      | 7.88      | 7.90      | 7.83      | 178.2                        | 177.8     | 174.9     | 169.7     | 173.9     |
| 9.0               | 0.5              | 0.5       | 0.6       | 0.7       | 0.6       | 14.12                   | 14.21     | 13.83     | 13.52     | 13.80     | 98.1                            | 98.8      | 96.3      | 95.1      | 96.1      | 7.70          | 7.71      | 7.88      | 7.90      | 7.82      | 177.5                        | 177.7     | 173.8     | 169.0     | 173.3     |
| 10.0              | 0.6              | 0.6       | 0.7       | 0.7       | 0.7       | 14.04                   | 13.95     | 13.63     | 13.51     | 13.65     | 97.8                            | 97.2      | 95.1      | 94.4      | 95.2      | 7.70          | 7.68      | 7.87      | 7.89      | 7.82      | 177.0                        | 177.6     | 172.6     | 168.2     | 172.3     |
| 11.0              | 0.7              | -         | 0.8       | 0.8       | 0.8       | 13.45                   | -         | 13.45     | 13.38     | 13.52     | 94.0                            | -         | 94.1      | 93.6      | 94.5      | 7.65          | -         | 7.86      | 7.89      | 7.82      | 179.0                        | -         | 171.8     | 167.6     | 171.7     |
| 12.0              | 0.7              | -         | 0.8       | 0.9       | 0.8       | 12.68                   | -         | 13.33     | 13.25     | 13.40     | 88.6                            | -         | 93.4      | 92.2      | 93.9      | 7.54          | -         | 7.85      | 7.88      | 7.81      | 180.2                        | -         | 171.1     | 166.9     | 171.0     |
| 13.0              | -                | -         | 0.9       | 0.9       | 0.9       | -                       | -         | 13.15     | 13.09     | 13.28     | -                               | -         | 92.3      | 92.2      | 93.2      | -             | -         | 7.84      | 7.85      | 7.81      | -                            | -         | 179.4     | 166.3     | 170.5     |
| 14.0              | -                | -         | 1.0       | 1.0       | 0.9       | -                       | -         | 12.97     | 12.97     | 13.09     | -                               | -         | 91.2      | 91.3      | 92.1      | -             | -         | 7.83      | 7.85      | 7.80      | -                            | -         | 169.9     | 165.7     | 169.6     |
| 15.0              | -                | -         | 1.0       | 1.0       | 1.0       | -                       | -         | 12.73     | 12.91     | 12.84     | -                               | -         | 89.7      | 91.1      | 90.5      | -             | -         | 7.81      | 7.84      | 7.78      | -                            | -         | 169.2     | 165.1     | 168.6     |
| 16.0              | -                | -         | 1.1       | 1.1       | 1.1       | -                       | -         | 12.25     | 12.51     | 12.6      | -                               | -         | 86.5      | 88.4      | 81.0      | -             | -         | 7.79      | 7.84      | 7.74      | -                            | -         | 169.0     | 164.8     | 168       |
| 17.0              | -                | -         | -         | 1.2       | -         | -                       | -         | -         | 11.70     | -         | -                               | -         | -         | 82.9      | -         | -             | -         | -         | 7.79      | -         | -                            | -         | -         | 164.5     | -         |
| 18.0              | -                | -         | -         | 1.2       | -         | -                       | -         | -         | 11.43     | -         | -                               | -         | -         | 81.0      | -         | -             | -         | -         | 7.77      | -         | -                            | -         | -         | 165.0     | -         |
| 19.0              | -                | -         | -         | 1.2       | -         | -                       | -         | -         | 11.25     | -         | -                               | -         | -         | 79.7      | -         | -             | -         | -         | 7.74      | -         | -                            | -         | -         | 165.7     | -         |
| 20.0              | -                | -         | -         | 1.3       | -         | -                       | -         | -         | 11.11     | -         | -                               | -         | -         | 78.8      | -         | -             | -         | -         | 7.71      | -         | -                            | -         | -         | 166.6     | -         |
| 21.0              | -                | -         | -         | 1.3       | -         | -                       | -         | -         | 10.99     | -         | -                               | -         | -         | 78.0      | -         | -             | -         | -         | 7.69      | -         | -                            | -         | -         | 167.1     | -         |
| 22.0              | -                | -         | -         | 1.3       | -         | -                       | -         | -         | 11.11     | -         | -                               | -         | -         | 78.8      | -         | -             | -         | -         | 7.66      | -         | -                            | -         | -         | 168.7     | -         |
| 23.0              | -                | -         | -         | 1.3       | -         | -                       | -         | -         | 10.96     | -         | -                               | -         | -         | 77.9      | -         | -             | -         | -         | 7.64      | -         | -                            | -         | -         | 169.2     | -         |
| 24.0              | -                | -         | -         | 1.4       | -         | -                       | -         | -         | 10.14     | -         | -                               | -         | -         | 72.0      | -         | -             | -         | -         | 7.62      | -         | -                            | -         | -         | 169.0     | -         |
| 25.0              | -                | -         | -         | 1.5       | -         | -                       | -         | -         | 9.91      | -         | -                               | -         | -         | 70.9      | -         | -             | -         | -         | 7.57      | -         | -                            | -         | -         | 168.9     | -         |
| 26.0              | -                | -         | -         | 1.6       | -         | -                       | -         | -         | 9.40      | -         | -                               | -         | -         | 68.3      | -         | -             | -         | -         | 7.54      | -         | -                            | -         | -         | 168.5     | -         |
| 27.0              | -                | -         | -         | 1.7       | -         | -                       | -         | -         | 8.50      | -         | -                               | -         | -         | 62.4      | -         | -             | -         | -         | 7.51      | -         | -                            | -         | -         | 169.0     | -         |
| 28.0              | -                | -         | -         | 1.8       | -         | -                       | -         | -         | 7.82      | -         | -                               | -         | -         | 56.5      | -         | -             | -         | -         | 7.47      | -         | -                            | -         | -         | 171.4     | -         |
| 29.0              | -                | -         | -         | 2.0       | -         | -                       | -         | -         | 6.90      | -         | -                               | -         | -         | 50.2      | -         | -             | -         | -         | 7.43      | -         | -                            | -         | -         | 172.8     | -         |
| 30.0              | -                | -         | -         | 2.0       | -         | -                       | -         | -         | 6.14      | -         | -                               | -         | -         | 44.6      | -         | -             | -         | -         | 7.39      | -         | -                            | -         | -         | 174.2     | -         |
| 31.0              | -                | -         | -         | 2.1       | -         | -                       | -         | -         | 5.19      | -         | -                               | -         | -         | 37.9      | -         | -             | -         | -         | 7.34      | -         | -                            | -         | -         | 177.7     | -         |
| 32.0              | -                | -         | -         | 2.3       | -         | -                       | -         | -         | 3.22      | -         | -                               | -         | -         | 23.7      | -         | -             | -         | -         | 7.27      | -         | -                            | -         | -         | 185.6     | -         |

Notes: "-" = data not available / data not applicable. Total depth at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.7, 10.2, 16.5, 31.0, and 15.2 m, respectively, at the time of winter sampling. Ice thickness at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 1.69, 1.25, 1.72, 1.63, and 1.53 m, respectively, at the time of winter sampling.

Table C.21: *In Situ* Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020

| Depth<br>(m)      | Temperature (°C) |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           | pH (pH units) |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|
|                   | JLO-02           | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                  | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                          | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02        | JLO-10    | JLO-01    | JLO-07    | JLO-09    | JLO-02                       | JLO-10    | JLO-01    | JLO-07    | JLO-09    |
| Date<br>Collected | 29-Jul-20        | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20               | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20                       | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20     | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20                    | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 |
| 1.0               | 13.9             | 13.7      | 13.4      | 13.6      | 13.3      | 11.00                   | 11.05     | 11.14     | 15.16     | 11.15     | 106.5                           | 106.5     | 106.8     | 107.2     | 106.6     | 8.19          | 8.13      | 8.13      | 8.12      | 8.05      | 154.6                        | 153.8     | 152.8     | 151.7     | 156.2     |
| 2.0               | 13.9             | 13.4      | 13.3      | 13.2      | 12.7      | 11.01                   | 11.14     | 11.19     | 11.27     | 11.43     | 106.5                           | 106.7     | 106.9     | 107.4     | 107.7     | 8.18          | 8.10      | 8.12      | 8.10      | 8.10      | 154.7                        | 152.9     | 152.4     | 151.8     | 151.0     |
| 3.0               | 10.9             | 11.0      | 12.0      | 10.4      | 11.5      | 12.20                   | 11.99     | 11.53     | 12.17     | 11.90     | 110.3                           | 108.6     | 106.9     | 109.2     | 109.1     | 8.09          | 8.06      | 8.11      | 8.05      | 8.07      | 151.6                        | 151.1     | 152.7     | 150.3     | 150.5     |
| 4.0               | 7.5              | 8.2       | 8.6       | 8.9       | 10.3      | 13.01                   | 12.85     | 12.72     | 12.62     | 12.20     | 108.3                           | 109.0     | 109.0     | 108.9     | 108.8     | 8.01          | 8.00      | 8.05      | 8.01      | 8.06      | 148.3                        | 148.5     | 148.8     | 149.0     | 149.4     |
| 5.0               | 7.0              | 7.2       | 7.1       | 7.8       | 8.9       | 12.93                   | 12.88     | 12.92     | 12.90     | 12.74     | 106.6                           | 106.7     | 106.8     | 108.5     | 110.0     | 7.95          | 7.93      | 7.93      | 7.99      | 8.02      | 148.1                        | 148.2     | 148.3     | 148.2     | 148.4     |
| 6.0               | 6.6              | 6.8       | 6.7       | 7.3       | 7.6       | 12.85                   | 12.84     | 12.93     | 12.96     | 12.86     | 104.8                           | 105.2     | 105.7     | 107.5     | 107.7     | 7.89          | 7.88      | 7.90      | 7.96      | 7.93      | 148.0                        | 148.2     | 148.0     | 148.1     | 148.4     |
| 7.0               | 6.4              | 6.7       | 6.6       | 6.9       | 6.7       | 12.83                   | 12.79     | 12.87     | 13.01     | 12.87     | 104.2                           | 104.7     | 105.0     | 106.9     | 105.2     | 7.88          | 7.88      | 7.90      | 7.94      | 7.92      | 148.1                        | 148.0     | 148.0     | 147.9     | 147.9     |
| 8.0               | 6.3              | 6.6       | 6.4       | 6.3       | 6.4       | 12.78                   | 12.80     | 12.86     | 12.91     | 12.88     | 103.6                           | 104.2     | 104.4     | 104.7     | 104.5     | 7.87          | 7.87      | 7.88      | 7.91      | 7.89      | 148.0                        | 148.2     | 147.8     | 147.8     | 147.9     |
| 9.0               | 6.3              | -         | 6.3       | 6.3       | 6.3       | 12.76                   | -         | 12.81     | 12.85     | 12.80     | 103.4                           | -         | 103.7     | 104.0     | 103.4     | 7.85          | -         | 7.86      | 7.88      | 7.88      | 148.1                        | -         | 147.9     | 147.9     | 147.9     |
| 10.0              | 6.3              | -         | 6.1       | 6.0       | 6.1       | 12.75                   | -         | 12.72     | 12.72     | 12.73     | 103.3                           | -         | 102.6     | 102.4     | 102.6     | 7.85          | -         | 7.85      | 7.85      | 7.85      | 148.0                        | -         | 147.9     | 147.8     | 147.9     |
| 11.0              | 6.2              | -         | 6.1       | 6.0       | 6.0       | 12.70                   | -         | 12.68     | 12.65     | 12.66     | 102.7                           | -         | 102.2     | 101.5     | 101.6     | 7.83          | -         | 7.84      | 7.83      | 7.82      | 148.1                        | -         | 147.9     | 147.9     | 147.9     |
| 12.0              | -                | -         | 6.0       | 5.9       | 5.9       | -                       | -         | 12.64     | 12.59     | 12.60     | -                               | -         | 101.6     | 100.9     | 101.0     | -             | -         | 7.82      | 7.82      | 7.82      | -                            | -         | 147.8     | 147.8     | 147.8     |
| 13.0              | -                | -         | 6.0       | 5.8       | 5.8       | -                       | -         | 12.63     | 12.57     | 12.55     | -                               | -         | 101.5     | 100.5     | 100.3     | -             | -         | 7.82      | 7.80      | 7.80      | -                            | -         | 147.8     | 147.8     | 147.9     |
| 14.0              | -                | -         | 5.8       | 5.7       | 5.7       | -                       | -         | 12.55     | 12.53     | 12.52     | -                               | -         | 100.5     | 100.0     | 100.0     | -             | -         | 7.81      | 7.79      | 7.79      | -                            | -         | 147.9     | 147.8     | 147.8     |
| 15.0              | -                | -         | 5.7       | 5.7       | 5.7       | -                       | -         | 12.51     | 12.50     | 12.50     | -                               | -         | 99.8      | 99.7      | 99.6      | -             | -         | 7.79      | 7.78      | 7.78      | -                            | -         | 147.9     | 147.9     | 147.8     |
| 16.0              | -                | -         | -         | 5.6       | 5.6       | -                       | -         | -         | 12.46     | 12.48     | -                               | -         | -         | 99.1      | 99.3      | -             | -         | -         | 7.78      | 7.78      | -                            | -         | -         | 147.9     | 147.8     |
| 17.0              | -                | -         | -         | 5.5       | 5.5       | -                       | -         | -         | 12.42     | 12.46     | -                               | -         | -         | 98.6      | 98.9      | -             | -         | -         | 7.77      | 7.77      | -                            | -         | -         | 147.9     | 147.8     |
| 18.0              | -                | -         | -         | 5.5       | -         | -                       | -         | -         | 12.40     | -         | -                               | -         | -         | 98.5      | -         | -             | -         | -         | 7.76      | -         | -                            | -         | -         | 147.9     | -         |
| 19.0              | -                | -         | -         | 5.5       | -         | -                       | -         | -         | 12.39     | -         | -                               | -         | -         | 98.3      | -         | -             | -         | -         | 7.75      | -         | -                            | -         | -         | 147.9     | -         |
| 20.0              | -                | -         | -         | 5.5       | -         | -                       | -         | -         | 12.37     | -         | -                               | -         | -         | 98.1      | -         | -             | -         | -         | 7.75      | -         | -                            | -         | -         | 147.9     | -         |
| 21.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.35     | -         | -                               | -         | -         | 97.9      | -         | -             | -         | -         | 7.74      | -         | -                            | -         | -         | 147.9     | -         |
| 22.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.34     | -         | -                               | -         | -         | 97.8      | -         | -             | -         | -         | 7.74      | -         | -                            | -         | -         | 147.9     | -         |
| 23.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.33     | -         | -                               | -         | -         | 97.7      | -         | -             | -         | -         | 7.74      | -         | -                            | -         | -         | 147.9     | -         |
| 24.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.31     | -         | -                               | -         | -         | 97.4      | -         | -             | -         | -         | 7.73      | -         | -                            | -         | -         | 147.9     | -         |
| 25.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.29     | -         | -                               | -         | -         | 97.3      | -         | -             | -         | -         | 7.73      | -         | -                            | -         | -         | 148.0     | -         |
| 26.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.28     | -         | -                               | -         | -         | 97.1      | -         | -             | -         | -         | 7.73      | -         | -                            | -         | -         | 147.9     | -         |
| 27.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.26     | -         | -                               | -         | -         | 97.0      | -         | -             | -         | -         | 7.73      | -         | -                            | -         | -         | 148.0     | -         |
| 28.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.25     | -         | -                               | -         | -         | 96.9      | -         | -             | -         | -         | 7.72      | -         | -                            | -         | -         | 148.0     | -         |
| 29.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.24     | -         | -                               | -         | -         | 96.8      | -         | -             | -         | -         | 7.72      | -         | -                            | -         | -         | 148.0     | -         |
| 30.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.23     | -         | -                               | -         | -         | 96.8      | -         | -             | -         | -         | 7.72      | -         | -                            | -         | -         | 148.0     | -         |
| 31.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.23     | -         | -                               | -         | -         | 96.7      | -         | -             | -         | -         | 7.72      | -         | -                            | -         | -         | 148.0     | -         |
| 32.0              | -                | -         | -         | 5.4       | -         | -                       | -         | -         | 12.22     | -         | -                               | -         | -         | 96.7      | -         | -             | -         | -         | 7.72      | -         | -                            | -         | -         | 148.0     | -         |

Notes: "-" = no data / not applicable. Total depth at stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.4, 8.8, 15.5, 34.1, and 18.9 m, respectively, at the time of summer sampling.

**Table C.22: *In Situ* Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)   | Temperature (°C) |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |           |
|----------------|------------------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|
|                | JLO-02           | JLO-10    | JLO-01    | JLO-07    | JLO-07    | JLO-09    | JLO-02                  | JLO-10    | JLO-01    | JLO-07    | JLO-07    | JLO-09    | JLO-02                          | JLO-10    | JLO-01    | JLO-07    | JLO-07    | JLO-09    |
| Date Collected | 30-Aug-20        | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 18-Aug-20 | 30-Aug-20 | 30-Aug-20               | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 18-Aug-20 | 30-Aug-20 | 30-Aug-20                       | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 18-Aug-20 | 30-Aug-20 |
| 0.5            | -                | -         | -         | -         | 8.4       | -         | -                       | -         | -         | -         | 10.46     | -         | -                               | -         | -         | -         | 91.2      | -         |
| 1.0            | 9.2              | 9.0       | 8.8       | 8.4       | 8.4       | 8.4       | 11.50                   | 11.50     | 11.59     | 11.59     | 10.48     | 11.5      | 100.5                           | 99.8      | 99.7      | 98.9      | 91.7      | 98.1      |
| 2.0            | 9.2              | 8.9       | 8.7       | 8.4       | 8.4       | 8.2       | 11.56                   | 11.59     | 11.59     | 11.62     | 10.48     | 11.6      | 100.6                           | 99.7      | 99.7      | 99.0      | 91.2      | 98.5      |
| 3.0            | 9.2              | 8.7       | 8.5       | 8.4       | 8.4       | 8.2       | 11.56                   | 11.59     | 11.62     | 11.61     | 10.46     | 11.6      | 100.5                           | 99.4      | 99.2      | 99.0      | 91.3      | 98.4      |
| 4.0            | 8.7              | 8.5       | 8.4       | 8.3       | 8.4       | 8.2       | 11.61                   | 11.62     | 11.60     | 11.61     | 10.44     | 11.6      | 99.4                            | 99.1      | 99.0      | 98.9      | 91.3      | 98.5      |
| 5.0            | 8.3              | 8.3       | 8.3       | 8.2       | 8.4       | 8.2       | 11.63                   | 11.61     | 11.62     | 11.60     | 10.43     | 11.6      | 99.1                            | 98.7      | 98.8      | 98.5      | 91.1      | 98.4      |
| 6.0            | 8.3              | 8.1       | 8.2       | 8.2       | 8.4       | 8.2       | 11.63                   | 11.60     | 11.62     | 11.58     | 10.43     | 11.6      | 98.7                            | 98.3      | 98.7      | 98.3      | 90.9      | 98.3      |
| 7.0            | 8.2              | 8.1       | 8.2       | 8.1       | 8.4       | 8.2       | 11.62                   | 11.58     | 11.59     | 11.57     | 10.44     | 11.6      | 98.6                            | 98.0      | 98.5      | 98.1      | 91.3      | 98.2      |
| 8.0            | 8.1              | 8.1       | 8.1       | 8.1       | 8.4       | 8.2       | 11.62                   | 11.55     | 11.58     | 11.55     | 10.44     | 11.6      | 98.5                            | 97.7      | 98.1      | 98.0      | 91.2      | 98.2      |
| 9.0            | 8.1              | 8.0       | 8.1       | 8.1       | 8.4       | 8.1       | 11.57                   | 11.61     | 11.55     | 11.54     | 10.44     | 11.6      | 97.9                            | 98.2      | 97.8      | 97.8      | 91.0      | 98.2      |
| 10.0           | 8.0              | -         | 8.1       | 8.1       | 8.4       | 8.1       | 11.56                   | -         | 11.53     | 11.53     | 10.43     | 11.6      | 97.6                            | -         | 97.7      | 97.7      | 91.0      | 98.0      |
| 11.0           | -                | -         | 8.1       | 8.1       | 8.4       | 8.1       | -                       | -         | 11.51     | 11.52     | 10.42     | 11.6      | -                               | -         | 97.4      | 97.6      | 91.0      | 97.9      |
| 12.0           | -                | -         | 8.1       | 8.1       | 8.4       | 8.1       | -                       | -         | 11.50     | 11.48     | 10.42     | 11.6      | -                               | -         | 97.4      | 97.3      | 91.1      | 97.9      |
| 13.0           | -                | -         | 8.1       | 8.1       | 8.4       | -         | -                       | -         | 11.49     | 11.48     | 10.38     | -         | -                               | -         | 97.3      | 97.3      | 90.7      | -         |
| 14.0           | -                | -         | 8.1       | 8.1       | 8.4       | -         | -                       | -         | 11.48     | 11.47     | 10.41     | -         | -                               | -         | 97.2      | 97.2      | 90.8      | -         |
| 15.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.47     | 10.42     | -         | -                               | -         | -         | 97.1      | 91.0      | -         |
| 16.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.45     | 10.38     | -         | -                               | -         | -         | 96.9      | 90.6      | -         |
| 17.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.45     | 10.40     | -         | -                               | -         | -         | 96.9      | 90.7      | -         |
| 18.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.44     | 10.42     | -         | -                               | -         | -         | 96.8      | 90.9      | -         |
| 19.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.44     | 10.37     | -         | -                               | -         | -         | 96.8      | 90.5      | -         |
| 20.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.43     | 10.37     | -         | -                               | -         | -         | 96.7      | 90.6      | -         |
| 21.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.43     | 10.40     | -         | -                               | -         | -         | 96.7      | 90.7      | -         |
| 22.0           | -                | -         | -         | 8.1       | 8.4       | -         | -                       | -         | -         | 11.42     | 10.36     | -         | -                               | -         | -         | 96.6      | 90.6      | -         |
| 23.0           | -                | -         | -         | 8.0       | 8.4       | -         | -                       | -         | -         | 11.40     | 10.38     | -         | -                               | -         | -         | 96.3      | 90.7      | -         |
| 24.0           | -                | -         | -         | 8.0       | 8.3       | -         | -                       | -         | -         | 11.39     | 10.42     | -         | -                               | -         | -         | 96.3      | 90.9      | -         |
| 25.0           | -                | -         | -         | 8.0       | 8.3       | -         | -                       | -         | -         | 11.37     | 10.41     | -         | -                               | -         | -         | 96.1      | 90.7      | -         |
| 26.0           | -                | -         | -         | 8.0       | 8.3       | -         | -                       | -         | -         | 11.34     | 10.42     | -         | -                               | -         | -         | 95.9      | 90.9      | -         |
| 27.0           | -                | -         | -         | 8.0       | 8.3       | -         | -                       | -         | -         | 11.21     | 10.37     | -         | -                               | -         | -         | 94.6      | 90.9      | -         |
| 28.0           | -                | -         | -         | 7.9       | 8.3       | -         | -                       | -         | -         | 11.16     | 10.41     | -         | -                               | -         | -         | 94.2      | 90.6      | -         |
| 29.0           | -                | -         | -         | 7.9       | 8.3       | -         | -                       | -         | -         | 11.13     | 10.40     | -         | -                               | -         | -         | 93.9      | 90.6      | -         |
| 30.0           |                  |           |           |           | 8.2       |           |                         |           |           |           | 10.46     |           |                                 |           |           |           | 90.7      |           |

Notes: "-" = no data / not applicable. August 18, 2020 sampling was conducted by Minnow. Camp Lake water profile sampling on all other dates was conducted by Baffinland. Total depth at Stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.4, 10.2, 15.8, 32.2, and 14.1 m, respectively, at the time of fall sampling.

**Table C.22: *In Situ* Water Quality Profile Data Collected at Camp Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)   | pH (pH units) |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |
|----------------|---------------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|
|                | JLO-02        | JLO-10    | JLO-01    | JLO-07    | JLO-07    | JLO-09    | JLO-02                       | JLO-10    | JLO-01    | JLO-07    | JLO-07    | JLO-09    |
| Date Collected | 30-Aug-20     | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 18-Aug-20 | 30-Aug-20 | 30-Aug-20                    | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 18-Aug-20 | 30-Aug-20 |
| 0.5            | -             | -         | -         | -         | 7.79      | -         | -                            | -         | -         | -         | 154.1     | -         |
| 1.0            | 8.11          | 8.11      | 8.11      | 8.08      | 7.80      | 8.00      | 153.8                        | 153.2     | 153.2     | 153.0     | 153.9     | 154.6     |
| 2.0            | 8.11          | 8.12      | 8.11      | 8.08      | 7.81      | 8.04      | 153.8                        | 153.6     | 153.2     | 153.1     | 154.2     | 153.3     |
| 3.0            | 8.12          | 8.11      | 8.11      | 8.08      | 7.82      | 8.04      | 154.4                        | 153.5     | 153.7     | 153.2     | 154.0     | 153.2     |
| 4.0            | 8.13          | 8.12      | 8.11      | 8.08      | 7.82      | 8.05      | 162.7                        | 154.0     | 153.2     | 153.2     | 154.2     | 153.3     |
| 5.0            | 8.13          | 8.11      | 8.11      | 8.08      | 7.83      | 8.05      | 154.5                        | 153.9     | 153.2     | 153.1     | 154.3     | 153.1     |
| 6.0            | 8.12          | 8.11      | 8.11      | 8.08      | 7.84      | 8.05      | 154.1                        | 154.2     | 153.2     | 152.9     | 154.1     | 153.1     |
| 7.0            | 8.11          | 8.10      | 8.11      | 8.08      | 7.84      | 8.06      | 155.7                        | 154.6     | 153.2     | 152.9     | 154.3     | 153.1     |
| 8.0            | 8.12          | 8.09      | 8.10      | 8.07      | 7.85      | 8.06      | 157.3                        | 154.9     | 153.2     | 152.8     | 154.1     | 153.1     |
| 9.0            | 8.11          | 8.09      | 8.09      | 8.07      | 7.85      | 8.06      | 156.8                        | 155.1     | 153.2     | 152.8     | 154.1     | 153.2     |
| 10.0           | 8.10          | -         | 8.09      | 8.07      | 7.85      | 8.07      | 156.8                        | -         | 153.0     | 152.8     | 154.0     | 153.2     |
| 11.0           | -             | -         | 8.08      | 8.07      | 7.86      | 8.07      | -                            | -         | 153.1     | 152.8     | 154.0     | 153.2     |
| 12.0           | -             | -         | 8.08      | 8.07      | 7.86      | 8.07      | -                            | -         | 153.1     | 152.8     | 154.1     | 153.3     |
| 13.0           | -             | -         | 8.08      | 8.07      | 7.86      | -         | -                            | -         | 153.2     | 152.8     | 154.0     | -         |
| 14.0           | -             | -         | 8.08      | 8.07      | 7.86      | -         | -                            | -         | 153.2     | 152.9     | 154.1     | -         |
| 15.0           | -             | -         | -         | 8.07      | 7.86      | -         | -                            | -         | -         | 153.0     | 154.1     | -         |
| 16.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.0     | 154.1     | -         |
| 17.0           | -             | -         | -         | 8.07      | 7.86      | -         | -                            | -         | -         | 153.0     | 154.2     | -         |
| 18.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.1     | 154.2     | -         |
| 19.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.3     | 154.2     | -         |
| 20.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.1     | 154.1     | -         |
| 21.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.3     | 154.1     | -         |
| 22.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.4     | 154.1     | -         |
| 23.0           | -             | -         | -         | 8.07      | 7.87      | -         | -                            | -         | -         | 153.4     | 154.1     | -         |
| 24.0           | -             | -         | -         | 8.06      | 7.86      | -         | -                            | -         | -         | 153.2     | 154.1     | -         |
| 25.0           | -             | -         | -         | 8.06      | 7.85      | -         | -                            | -         | -         | 153.3     | 154.0     | -         |
| 26.0           | -             | -         | -         | 8.05      | 7.86      | -         | -                            | -         | -         | 153.4     | 154.1     | -         |
| 27.0           | -             | -         | -         | 8.02      | 7.85      | -         | -                            | -         | -         | 153.6     | 154.1     | -         |
| 28.0           | -             | -         | -         | 8.02      | 7.84      | -         | -                            | -         | -         | 153.6     | 154.0     | -         |
| 29.0           | -             | -         | -         | 8.00      | 7.84      | -         | -                            | -         | -         | 153.9     | 154.0     | -         |
| 30.0           |               |           |           |           | 7.81      |           |                              |           |           |           | 153.8     |           |

Notes: "-" = no data / not applicable. August 18, 2020 sampling was conducted by Minnow. Camp Lake water profile sampling on all other dates was conducted by Baffinland. Total depth at Stations JLO-02, JLO-10, JLO-01, JLO-07, and JLO-09 was 11.4, 10.2, 15.8, 32.2, and 14.1 m, respectively, at the time of fall sampling.

**Table C.23: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Camp Lake Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Categorization & Replicate ID |        | Date Sampled | Station Depth (m) | Secchi Depth (m) | Colour/ Clarity   | Depth sampled | Temperature (°C) | Dissolved Oxygen |          | pH (units) | Specific Conductance (µS/cm) |
|-------------------------------|--------|--------------|-------------------|------------------|-------------------|---------------|------------------|------------------|----------|------------|------------------------------|
|                               |        |              |                   |                  |                   |               |                  | (mg/L)           | (% sat.) |            |                              |
| Littoral (Shallow) Stations   | JLO-02 | 18-Aug-20    | 11.0              | 4.29             | clear, colourless | surface       | 8.3              | 10.58            | 92.1     | 7.78       | 154.6                        |
|                               |        |              |                   |                  |                   | bottom        | 8.2              | 9.63             | 83.3     | 7.73       | 155.7                        |
|                               | JLO-21 | 18-Aug-20    | 10.0              | 4.72             | clear, colourless | surface       | 8.3              | 10.71            | 92.9     | 7.60       | 155.6                        |
|                               |        |              |                   |                  |                   | bottom        | 8.3              | 9.34             | 81.8     | 7.32       | 154.7                        |
|                               | JLO-20 | 18-Aug-20    | 7.0               | 5.15             | clear, colourless | surface       | 8.3              | 10.65            | 92.7     | 7.65       | 154.2                        |
|                               |        |              |                   |                  |                   | bottom        | 8.3              | 10.14            | 88.3     | 7.64       | 154.1                        |
|                               | JLO-19 | 11-Aug-20    | 7.5               | 6.23             | clear, colourless | surface       | 10.8             | 10.58            | 98.6     | 8.13       | 148.1                        |
|                               |        |              |                   |                  |                   | bottom        | 9.8              | 9.12             | 83.8     | 7.23       | 147.3                        |
|                               | JLO-18 | 11-Aug-20    | 12.0              | 7.10             | clear, colourless | surface       | 10.9             | 10.33            | 95.9     | 8.13       | 150.1                        |
|                               |        |              |                   |                  |                   | bottom        | 7.1              | 8.96             | 75.4     | 7.56       | 158.2                        |
| Profundal (Deep) Stations     | JLO-01 | 18-Aug-20    | 18.0              | 5.08             | clear, colourless | surface       | 8.4              | 10.89            | 95.7     | 7.70       | 154.4                        |
|                               |        |              |                   |                  |                   | bottom        | 8.3              | 9.90             | 86.4     | 7.27       | 155.5                        |
|                               | JLO-07 | 11-Aug-20    | 33.0              | 6.40             | clear, colourless | surface       | 10.4             | 10.40            | 95.7     | 8.70       | 147.4                        |
|                               |        |              |                   |                  |                   | bottom        | 6.0              | 11.04            | 91.1     | 7.26       | 144.0                        |
|                               | JLO-16 | 11-Aug-20    | 16.0              | 6.44             | clear, colourless | surface       | 10.3             | 10.42            | 95.8     | 8.05       | 148.2                        |
|                               |        |              |                   |                  |                   | bottom        | 6.8              | 10.01            | 84.5     | 7.53       | 145.1                        |
|                               | JLO-11 | 11-Aug-20    | 28.5              | 7.50             | clear, colourless | surface       | 10.0             | 10.57            | 96.7     | 7.94       | 147.4                        |
|                               |        |              |                   |                  |                   | bottom        | 5.8              | 12.22            | 101.9    | 7.45       | 144.4                        |
|                               | JLO-12 | 11-Aug-20    | 17.0              | 5.71             | clear, colourless | surface       | 9.8              | 10.59            | 95.6     | 7.72       | 147.3                        |
|                               |        |              |                   |                  |                   | bottom        | 6.2              | 11.11            | 92.5     | 7.27       | 144.8                        |



**Table C.24: Statistical Comparison of Bottom *In Situ* Water Quality Between Camp Lake Littoral and Profundal Stations, Mary River Project CREMP, August 2020**

| Parameter                       | Statistical Test Results      |                 |                                       |         | Summary Statistics |                |                    |                |         |         |
|---------------------------------|-------------------------------|-----------------|---------------------------------------|---------|--------------------|----------------|--------------------|----------------|---------|---------|
|                                 | Statistical Test <sup>a</sup> | Transform-ation | Significant Difference Between Areas? | P-value | Lake Zone          | Mean ( n = 5 ) | Standard Deviation | Standard Error | Minimum | Maximum |
| Secchi Depth (m)                | tequal                        | none            | NO                                    | 0.298   | Littoral           | 5.49           | 1.15               | 0.51           | 4.29    | 7.10    |
|                                 |                               |                 |                                       |         | Profundal          | 6.22           | 0.91               | 0.41           | 5.08    | 7.50    |
| Temperature (°C)                | tequal                        | none            | YES                                   | 0.025   | Littoral           | 8.34           | 0.96               | 0.43           | 7.10    | 9.80    |
|                                 |                               |                 |                                       |         | Profundal          | 6.62           | 1.01               | 0.45           | 5.80    | 8.30    |
| Dissolved Oxygen (mg/L)         | tequal                        | none            | YES                                   | 0.017   | Littoral           | 9.4            | 0.5                | 0.2            | 9.0     | 10.1    |
|                                 |                               |                 |                                       |         | Profundal          | 10.9           | 0.9                | 0.4            | 9.9     | 12.2    |
| Dissolved Oxygen (% saturation) | tequal                        | none            | YES                                   | 0.045   | Littoral           | 82.5           | 4.7                | 2.1            | 75.4    | 88.3    |
|                                 |                               |                 |                                       |         | Profundal          | 91.3           | 6.8                | 3.0            | 84.5    | 101.9   |
| pH (units)                      | tequal                        | none            | NO                                    | 0.241   | Littoral           | 7.50           | 0.21               | 0.10           | 7.23    | 7.73    |
|                                 |                               |                 |                                       |         | Profundal          | 7.36           | 0.13               | 0.06           | 7.26    | 7.53    |
| Specific Conductance (µS/cm)    | tequal                        | none            | YES                                   | 0.035   | Littoral           | 154.0          | 4.1                | 1.8            | 147.3   | 158.2   |
|                                 |                               |                 |                                       |         | Profundal          | 146.8          | 4.9                | 2.2            | 144.0   | 155.5   |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).



**Table C.25: Statistical Comparison of Bottom *In Situ* Water Quality Between Camp Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |                 |       |                    |                |         |         |
|-----------------------------|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|-----------------|-------|--------------------|----------------|---------|---------|
|                             |                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Station Depth (m)               | tequal                        | none           | NO                                    | 0.690   | Reference          | 4               | 10.00 | 1.08               | 0.54           | 8.50    | 11.00   |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 9.50  | 2.18               | 0.97           | 7.00    | 12.00   |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.002   | Reference          | 5               | 8.12  | 0.64               | 0.29           | 7.38    | 9.15    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 5.49  | 1.15               | 0.51           | 4.29    | 7.10    |
|                             | Temperature (°C)                | tequal                        | none           | YES                                   | 0.061   | Reference          | 5               | 9.32  | 0.29               | 0.13           | 8.90    | 9.70    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 8.34  | 0.96               | 0.43           | 7.10    | 9.80    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 12.6  | 0.7                | 0.3            | 11.8    | 13.3    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 9.4   | 0.5                | 0.2            | 9.0     | 10.1    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 111.9 | 5.2                | 2.3            | 104.6   | 116.7   |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 82.5  | 4.7                | 2.1            | 75.4    | 88.3    |
|                             | pH (units)                      | tequal                        | none           | YES                                   | 0.060   | Reference          | 5               | 7.19  | 0.23               | 0.10           | 6.94    | 7.56    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 7.50  | 0.21               | 0.10           | 7.23    | 7.73    |
|                             | Specific Conductance (µS/cm)    | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 76.7  | 3.2                | 1.4            | 74.5    | 82.1    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 154.0 | 4.1                | 1.8            | 147.3   | 158.2   |
| Profundal (Deep) Stations   | Station Depth (m)               | tequal                        | none           | NO                                    | 0.605   | Reference          | 5               | 20.60 | 1.56               | 0.70           | 19.00   | 23.00   |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 22.50 | 7.73               | 3.46           | 16.00   | 33.00   |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.006   | Reference          | 5               | 8.39  | 0.96               | 0.43           | 7.18    | 9.84    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 6.22  | 0.91               | 0.41           | 5.08    | 7.50    |
|                             | Temperature (°C)                | tequal                        | none           | NO                                    | 0.120   | Reference          | 5               | 5.82  | 0.19               | 0.09           | 5.60    | 6.10    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 6.62  | 1.01               | 0.45           | 5.80    | 8.30    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | log10          | YES                                   | 0.003   | Reference          | 5               | 13.6  | 1.3                | 0.6            | 12.8    | 15.8    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 10.9  | 0.9                | 0.4            | 9.9     | 12.2    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | log10          | YES                                   | 0.006   | Reference          | 5               | 110.6 | 10.3               | 4.6            | 103.5   | 127.9   |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 91.3  | 6.8                | 3.0            | 84.5    | 101.9   |
|                             | pH (units)                      | tequal                        | none           | YES                                   | 0.002   | Reference          | 5               | 6.70  | 0.30               | 0.13           | 6.27    | 6.95    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 7.36  | 0.13               | 0.06           | 7.26    | 7.53    |
|                             | Specific Conductance (µS/cm)    | M-W                           | rank           | YES                                   | 0.008   | Reference          | 5               | 75.5  | 1.6                | 0.7            | 74.0    | 78.1    |
|                             |                                 |                               |                |                                       |         | Camp               | 5               | 146.8 | 4.9                | 2.2            | 144.0   | 155.5   |

Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).

**Table C.26: Water Chemistry at Camp Lake (JLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2020**

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Winter Sampling Event |            |            |            |            |            |            |            |            |            | Spring Sampling Event | Summer Sampling Event |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|-----------------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | JLO-02                | JLO-02     | JLO-10     | JLO-10     | JLO-01     | JLO-01     | JLO-07     | JLO-07     | JLO-09     | JLO-09     | JLO-01                | JLO-02                | JLO-02     | JLO-10     | JLO-10     | JLO-01     | JLO-01     |
|                        |                                    |         |                                            |                             | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | outlet                | bottom                | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 12-Apr-20             | 12-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 14-Apr-20             | 14-Apr-20             | 04-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  |
| Conventional           | Conductivity (lab)                 | µmho/cm | -                                          | -                           | 179                   | 186        | 178        | 187        | 170        | 182        | 179        | 176        | 171        | 185        | 163                   | 152                   | 158        | 152        | 159        | 151        | 156        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.84                  | 7.90       | 7.79       | 7.79       | 7.66       | 7.81       | 7.19       | 7.82       | 7.69       | 7.77       | 7.83                  | 7.89                  | 8.14       | 7.90       | 8.13       | 8.06       | 8.12       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 96.3                  | 102        | 97.4       | 99.4       | 90.2       | 101        | 91.1       | 96         | 90.5       | 98.2       | 76.4                  | 70.7                  | 72.3       | 68.2       | 70.7       | 73.5       | 72         |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0                  | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 100                   | 93         | 118        | 132        | 112        | 114        | 130        | 128        | 119        | 100        | 132                   | 80                    | 86         | 79         | 93         | 82         | 86         |
|                        | Turbidity                          | NTU     | -                                          | -                           | <0.10                 | 0.13       | <0.10      | <0.10      | <0.10      | <0.10      | 0.15       | 0.14       | <0.10      | 0.28       | 1.03                  | 0.81                  | 0.87       | 0.85       | 0.73       | 0.81       | 0.75       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 79                    | 84         | 80         | 84         | 76         | 83         | 76         | 79         | 79         | 83         | 69                    | 65.1                  | 68.7       | 66.3       | 67.4       | 65.0       | 67.5       |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.018                 | 0.042      | 0.019      | 0.020      | <0.010     | 0.020      | <0.010     | 0.020      | <0.010     | 0.019      | <0.010                | <0.0050               | <0.0050    | <0.0050    | 0.0054     | <0.0050    | <0.0050    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.029                 | 0.096      | 0.041      | 0.032      | 0.049      | 0.030      | 0.145      | 0.031      | 0.051      | 0.033      | 0.053                 | 0.0410                | 0.0404     | 0.0433     | 0.0402     | 0.0491     | 0.0407     |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050               | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15      | 0.17       | <0.15      | 0.40       | <0.15      | 0.25       | 0.17       | <0.15      | <0.15      | <0.15                 | 0.109                 | 0.126      | 0.126      | 0.114      | 0.105      | 0.115      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.78                  | 2.20       | 2.11       | 2.30       | 2.05       | 2.31       | 1.88       | 2.24       | 3.07       | 2.69       | 2.74                  | 5.17                  | 2.19       | 1.78       | 2.34       | 2.46       | 2.06       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.62                  | 3.00       | 2.72       | 2.82       | 2.62       | 2.63       | 2.32       | 2.64       | 2.79       | 3.22       | 3.76                  | 1.96                  | 2.04       | 1.89       | 2.07       | 1.95       | 2.08       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.0030               | 0.0092     | <0.0030    | <0.0030    | 0.0032     | 0.0083     | 0.0042     | 0.0043     | <0.0030    | <0.0030    | 0.0066                | 0.0034                | 0.0043     | 0.0038     | 0.0025     | 0.0027     | 0.0021     |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | <0.0010               | 0.0115     | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010               | 0.0028                | 0.0023     | 0.0016     | 0.0025     | 0.0036     | 0.0019     |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10                 | <0.050                | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 5.43                  | 5.73       | 5.45       | 5.73       | 5.16       | 5.60       | 8.09       | 5.39       | 5.27       | 5.76       | 4.73                  | 4.48                  | 4.66       | 4.46       | 4.63       | 4.46       | 4.61       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 5.05                  | 5.53       | 5.07       | 5.31       | 4.79       | 5.19       | 4.79       | 5.01       | 4.87       | 5.32       | 4.46                  | 4.48                  | 4.66       | 4.48       | 4.64       | 4.47       | 4.62       |
|                        | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.1                         | <0.0030               | 0.0183     | 0.0035     | 0.0109     | <0.0030    | 0.0035     | 0.0064     | 0.0539     | 0.0043     | 0.0117     | 0.0219                | 0.0190                | 0.0162     | 0.0176     | 0.0167     | 0.0108     | 0.0178     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.00011               | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
| Total Metals           | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00876               | 0.00918    | 0.00867    | 0.00885    | 0.00841    | 0.00901    | 0.00868    | 0.00904    | 0.00912    | 0.00976    | 0.00776               | 0.00711               | 0.00757    | 0.00725    | 0.00754    | 0.00686    | 0.00753    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010                | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.0001                      | <0.000010             | 0.000017   | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | 0.000016   | <0.000010  | <0.000010  | <0.000010             | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 18.3                  | 19.7       | 18.5       | 19.1       | 17.5       | 19.3       | 17.7       | 19.1       | 17.6       | 19.1       | 15.0                  | 13.4                  | 14.2       | 13.7       | 14.1       | 14.3       | 13.9       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | 0.00011               | 0.00013    | <0.00010   | 0.00011    | <0.00010   | 0.00011    |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.004                       | 0.00132               | 0.00142    | 0.00116    | 0.00124    | 0.00098    | 0.00116    | 0.00129    | 0.00195    | 0.00117    | 0.00133    | 0.00095               | 0.00092               | 0.00096    | 0.00088    | 0.00096    | 0.00082    | 0.00093    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030                | 0.033                 | 0.031      | 0.026      | 0.028      | 0.013      | 0.037      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | 0.000108   | <0.000050  | 0.000114   | <0.000050  | <0.000050  | <0.000050  | 0.000091   | <0.000050  | 0.000067   | <0.000050             | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0015                | 0.0016     | 0.0016     | 0.0016     | 0.0017     | 0.0017     | 0.0015     | 0.0019     | 0.0013     | 0.0013     | 0.0013                | 0.0011                | 0.0013     | 0.0012     | 0.0013     | 0.0012     | 0.0012     |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 12.0                  | 12.4       | 12.0       | 12.0       | 11.6       | 12.3       | 11.4       | 11.8       | 11.1       | 12.3       | 9.42                  | 8.40                  | 8.55       | 8.45       | 8.44       | 8.69       | 8.65       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.000367              | 0.000479   | 0.000301   | 0.000311   | 0.000460   | 0.000322   | 0.0124     | 0.00123    | 0.000614   | 0.000328   | 0.00210               | 0.00302               | 0.00303    | 0.00296    | 0.00312    | 0.00182    | 0.00315    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000455              | 0.000505   | 0.000466   | 0.000484   | 0.000417   | 0.000476   | 0.000388   | 0.000584   | 0.000456   | 0.000527   | 0.000393              | 0.000384              | 0.000430   | 0.000386   | 0.000434   | 0.000462   | 0.000405   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00075               | 0.00087    | 0.00072    | 0.00085    | 0.00069    | 0.00086    | 0.00082    | 0.00098    | 0.00077    | 0.00091    | 0.00084               | 0.00053               | 0.00057    | 0.00051    | 0.00057    | 0.00061    | 0.00060    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.50                  | 1.61       | 1.50       | 1.56       | 1.46       | 1.59       | 1.41       | 1.57       | 1.55       | 1.72       | 1.33                  | 1.29                  | 1.33       | 1.25       | 1.32       | 1.35       | 1.33       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.000050             | <0.000050  | 0.000059   | 0.000057   | <0.000050  | <0.000050  |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.42                  | 0.42       | 0.41       | 0.42       | 0.46       | 0.42       | 1.51       | 0.43       | 0.45       | 0.42       | 0.46                  | 0.45                  | 0.47       | 0.46       | 0.46       | 0.45       | 0.46       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 2.39                  | 2.56       | 2.42       | 2.44       | 2.35       | 2.54       | 3.90       | 2.64       | 2.40       | 2.59       | 2.00                  | 1.83                  | 1.99       | 1.78       | 1.89       | 1.95       | 1.97       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0147                | 0.0156     | 0.0147     | 0.0155     | 0.0140     | 0.0153     | 0.0155     | 0.0153     | 0.0149     | 0.0160     | 0.0121                | 0.0110                | 0.0115     | 0.0111     | 0.0115     | 0.0122     | 0.0114     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00014    | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.        |            |

**Table C.26: Water Chemistry at Camp Lake (JLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2020**

|                        | Parameters                         | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |                |               |                |              | Fall Sampling Event |                |               |                |               |                |               |                |               |                |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|----------------|---------------|----------------|--------------|---------------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|
|                        |                                    |         |                                            |                             | JLO-07 bottom         | JLO-07 surface | JLO-09 bottom | JLO-09 surface | J0-01 outlet | JLO-02 bottom       | JLO-02 surface | JLO-10 bottom | JLO-10 surface | JLO-01 bottom | JLO-01 surface | JLO-07 bottom | JLO-07 surface | JLO-09 bottom | JLO-09 surface |
|                        |                                    |         |                                            |                             | 29-Jul-20             | 29-Jul-20      | 29-Jul-20     | 29-Jul-20      | 03-Aug-20    | 30-Aug-20           | 30-Aug-20      | 30-Aug-20     | 30-Aug-20      | 30-Aug-20     | 30-Aug-20      | 30-Aug-20     | 30-Aug-20      | 30-Aug-20     | 30-Aug-20      |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 151                   | 154            | 154           | 155            | 155          | 160                 | 157            | 157           | 156            | 156           | <3.0           | 158           | 157            | 158           | 157            |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.13                  | 8.13           | 7.85          | 8.13           | 8.06         | 8.14                | 8.15           | 8.12          | 8.13           | 8.06          | 6.75           | 8.12          | 8.08           | 8.13          | 8.12           |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 69.2                  | 70.8           | 70.6          | 72.3           | 74.1         | 82                  | 80             | 79.5          | 78.9           | 79.9          | <50            | 78.6          | 79             | 76.3          | 78.5           |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0           | <2.0          | 2.1            | <2.0         | <2.0                | <2.0           | <2.0          | <2.0           | <2.0          | <2.0           | <2.0          | <2.0           | <2.0          | <2.0           |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 89                    | 89             | 84            | 84             | 85           | 83                  | <10            | 80            | 89             | 98            | 88             | 89            | 126            | <10           | 167            |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.77                  | 0.71           | 0.79          | 0.72           | 0.72         | 0.36                | 0.4            | 0.33          | 0.29           | 0.34          | <0.10          | 0.35          | 0.33           | 0.33          | 0.31           |
| Nutrients and Organics | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 65.7                  | 67.2           | 67.4          | 67.4           | 75           | 72                  | 70             | 71            | 70             | 69            | <10            | 67            | 69             | 68            | 71             |
|                        | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.0050               | <0.0050        | <0.0050       | <0.0050        | <0.010       | <0.010              | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         | 0.02          | <0.010         | <0.010        | <0.010         |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.0563                | 0.0395         | 0.0398        | 0.0408         | 0.024        | 0.029               | 0.028          | 0.028         | 0.027          | 0.027         | <0.020         | 0.052         | 0.03           | 0.028         | 0.027          |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0010               | <0.0010        | <0.0010       | <0.0010        | <0.0050      | <0.0050             | <0.0050        | <0.0050       | <0.0050        | <0.0050       | <0.0050        | <0.0050       | <0.0050        | <0.0050       | <0.0050        |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.113                 | 0.108          | 0.114         | 0.111          | <0.15        | 0.22                | 0.19           | <0.15         | <0.15          | <0.15         | <0.15          | <0.15         | <0.15          | <0.15         | <0.15          |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.83                  | 1.92           | 1.96          | 1.92           | 2.52         | 2.45                | 2.7            | 2.49          | 2.38           | 2.39          | <0.50          | 2.58          | 2.37           | 2.46          | 2.39           |
| Anions                 | Total Organic Carbon               | mg/L    | -                                          | -                           | 1.99                  | 1.94           | 2.02          | 1.92           | 3.66         | 3.1                 | 2.85           | 3.17          | 3.02           | 2.96          | 1.43           | 2.98          | 2.99           | 3.05          | 2.94           |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0036                | 0.0026         | 0.0056        | 0.0030         | 0.0037       | <0.0030             | <0.0030        | 0.0072        | <0.0030        | <0.0030       | <0.0030        | 0.0078        | <0.0030        | <0.0030       | <0.0030        |
|                        | Phenols                            | mg/L    | 0.004 <sup>e</sup>                         | -                           | <0.0010               | 0.0043         | 0.0038        | 0.0045         | <0.0010      | <0.0010             | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        | 0.0036        | <0.0010        | <0.0010       | 0.0045         |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.050                | <0.050         | <0.050        | <0.050         | <0.10        | <0.10               | <0.10          | <0.10         | <0.10          | <0.10         | <0.10          | <0.10         | <0.10          | <0.10         | <0.10          |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 4.49                  | 4.56           | 4.54          | 4.55           | 4.58         | 5.05                | 4.96           | 4.92          | 4.85           | 4.85          | <0.50          | 5.02          | 4.83           | 4.83          | 4.81           |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 4.45                  | 4.60           | 4.57          | 4.59           | 4.40         | 5.01                | 4.77           | 4.9           | 4.76           | 4.73          | <0.30          | 6.82          | 4.75           | 4.73          | 4.76           |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.1                         | 0.0166                | 0.0177         | 0.0145        | 0.0151         | 0.0106       | 0.0046              | 0.0057         | 0.0043        | 0.0056         | 0.0043        | <0.0030        | 0.0052        | 0.0046         | 0.0057        | 0.0061         |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010              | <0.00010       | <0.00010      | <0.00010       | <0.00010     | <0.00010            | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010       | <0.00010      | <0.00010       | <0.00010     | <0.00010            | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | 0.0001         | <0.00010      | <0.00010       |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00735               | 0.00743        | 0.00727       | 0.00759        | 0.00748      | 0.00787             | 0.00741        | 0.00744       | 0.00772        | 0.00725       | <0.000050      | 0.0073        | 0.00757        | 0.00741       | 0.00755        |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00010              | <0.00010       | <0.00010      | <0.00010       | <0.00050     | <0.00050            | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.000050             | <0.000050      | <0.000050     | <0.000050      | <0.00050     | <0.00050            | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010         | <0.010        | <0.010         | <0.010       | <0.010              | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.0001                      | <0.000050             | <0.000050      | <0.000050     | <0.000050      | <0.000010    | <0.000010           | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 14.2                  | 14.0           | 13.9          | 14.4           | 14.0         | 15.4                | 15.3           | 15.3          | 15.5           | 15.3          | <0.050         | 15            | 14.9           | 15.1          | 14.8           |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00021               | 0.00010        | <0.00010      | <0.00010       | <0.00050     | <0.00050            | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       | <0.00050      | <0.00050       |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | <0.00010              | <0.00010       | <0.00010      | <0.00010       | <0.00010     | <0.00010            | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.004                       | 0.00092               | 0.00091        | 0.00089       | 0.00091        | 0.00087      | 0.0009              | 0.00082        | 0.00087       | 0.00087        | 0.00082       | <0.00050       | 0.00083       | 0.00103        | 0.00087       | 0.0009         |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | 0.050                 | 0.027          | 0.023         | 0.025          | 0.068        | <0.030              | <0.030         | <0.030        | <0.030         | <0.030        | <0.030         | <0.030        | <0.030         | <0.030        | <0.030         |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050      | <0.000050     | <0.000050      | <0.000050    | <0.000050           | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0012                | 0.0012         | 0.0012        | 0.0012         | 0.0011       | 0.0012              | 0.0013         | 0.0011        | 0.0012         | <0.0010       | <0.0010        | 0.0011        | 0.0011         | 0.0011        | 0.0011         |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 8.55                  | 8.70           | 8.69          | 8.45           | 8.62         | 9.71                | 9.35           | 9.37          | 9.45           | 9.35          | <0.050         | 9.26          | 9.44           | 9.52          | 9.6            |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.00296               | 0.00296        | 0.00297       | 0.00302        | 0.00354      | 0.00123             | 0.0011         | 0.00121       | 0.00119        | 0.00125       | <0.000070      | 0.00108       | 0.00124        | 0.00119       | 0.00129        |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.000050             | <0.000050      | <0.000050     | <0.000050      | <0.000050    | <0.000050           | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      | <0.000050     | <0.000050      |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000376              | 0.000407       | 0.000387      | 0.000389       | 0.000357     | 0.000407            | 0.000415       | 0.00039       | 0.000416       | 0.000412      | <0.000050      | 0.00042       | 0.000391       | 0.000389      | 0.000407       |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00060               | 0.00052        | 0.00052       | <0.00050       | 0.00066      | 0.00058             | 0.00061        | 0.0006        | 0.0006         | 0.00058       | <0.00050       | 0.00063       | 0.00056        | 0.0006        | 0.00066        |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.31                  | 1.29           | 1.28          | 1.31           | 1.23         | 1.35                | 1.31           | 1.33          | 1.32           | 1.29          | <0.20          | 1.3           | 1.29           | 1.3           | 1.3            |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.000050             | <0.000050      | <0.000050     | <0.000050      | <0.0010      | <0.0010             | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.48                  | 0.46           | 0.45          | 0.45           | 0.40         | 0.37                | 0.34           | 0.33          | 0.35           | 0.33          | <0.10          | 0.34          | 0.34           | 0.34          | 0.36           |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010      | <0.000010     | <0.000010      | <0.000010    | <0.000010           | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      | <0.000010     | <0.000010      |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.93                  | 1.88           | 1.88          | 1.88           | 1.87         | 2.2                 | 2.05           | 2.09          | 2.1            | 2.07          | <0.050         | 2.06          | 2.09           | 2.11          | 2.1            |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0111                | 0.0113         | 0.0112        | 0.0109         | 0.0111       | 0.0116              | 0.0112         | 0.0113        | 0.0114         | 0.0112        | <0.00010       | 0.0114        | 0.0111         | 0.0112        | 0.0111         |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.000010             | <0.000010      | <0.000010     | <0.000010      | <0.00010     | <0.00010            | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010       | <0.00010      | <0.00010       | <0.00010     | <0.00010            | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       | <0.00010      | <0.00010       |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.00075               | 0.00080        | 0.00073       | 0.00076        | <0.010       | <0.010              | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         | <0.010        | <0.010         |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00124               | 0.00126        | 0.00126       | 0.00123        | 0.00120      | 0.00147             | 0.00131        | 0.00133       | 0.00134        | 0.00131       | <0.000010      | 0.00128       | 0.00133        | 0.00131       | 0.00131        |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | <0.00050              | <0.00050       | <0.00050      | <0.00050       | <0.0010      | <0.0010             | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        | <0.0010       | <0.0010        |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | 0.0259         | <0.0030       | <0.0030        | <0.0030      | <0.0030             | <0.0030        | <0.0030       | <0.0030        | <0.0030       | <0.0030        | <0.0030       | <0.0030        | <0.0030       | <0.0030        |

**BOLD** Indicates parameter concentration above applicable Water Quality Guideline.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsic (2013) using baseline water quality data specific to the Camp Lake system.

**Table C.27: Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between Camp Lake and Reference Lake 3 in 2020, and Between Camp Lake 2020 and Baseline (2005 to 2013) Data, Mary River Project CREMP**

| Parameter                          | Camp Lake vs Reference Lake 3 in 2020 |      | Camp Lake 2020 vs Baseline |        |      |
|------------------------------------|---------------------------------------|------|----------------------------|--------|------|
|                                    | Summer                                | Fall | Winter                     | Summer | Fall |
| Conductivity (lab)                 | 2.0                                   | 1.8  | 1.4                        | 1.3    | 1.2  |
| Hardness (as CaCO <sub>3</sub> )   | 2.0                                   | 1.9  | 1.5                        | 1.2    | 1.2  |
| Total Suspended Solids (TSS)       | 1.0                                   | 1.0  | 1.0                        | 1.0    | 1.0  |
| Total Dissolved Solids (TDS)       | 2.1                                   | 1.7  | 1.4                        | 1.1    | 1.1  |
| Turbidity                          | 5.3                                   | 2.2  | 0.7                        | 1.5    | 1.0  |
| Alkalinity (as CaCO <sub>3</sub> ) | 1.5                                   | 1.9  | 1.2                        | 1.2    | 1.1  |
| Total Ammonia                      | 0.5                                   | 0.8  | 0.3                        | 0.1    | 0.4  |
| Nitrate                            | 2.2                                   | 1.5  | 0.5                        | 0.4    | 0.3  |
| Nitrite                            | 0.2                                   | 1.0  | 1.9                        | 0.0    | 1.0  |
| Total Kjeldahl Nitrogen (TKN)      | 0.8                                   | 1.0  | 1.1                        | 0.6    | 0.5  |
| Dissolved Organic Carbon           | 0.7                                   | 0.7  | 1.2                        | 1.3    | 1.3  |
| Total Organic Carbon               | 0.4                                   | 0.8  | 1.4                        | 1.0    | 1.5  |
| Total Phosphorus                   | 0.8                                   | 1.3  | 0.7                        | 0.7    | 0.8  |
| Phenols                            | 2.8                                   | 1.2  | 2.1                        | 2.1    | 1.3  |
| Bromide (Br)                       | 0.5                                   | 1.0  | 1.1                        | 0.2    | 0.4  |
| Chloride (Cl)                      | 3.3                                   | 3.3  | 4.1                        | 2.3    | 2.0  |
| Sulphate (SO <sub>4</sub> )        | 1.3                                   | 1.3  | 3.7                        | 3.1    | 1.6  |
| Aluminum (Al)                      | 5.3                                   | 1.6  | 7.3                        | 1.3    | 0.8  |
| Antimony (Sb)                      | 1.0                                   | 1.0  | 1.0                        | 1.0    | 1.0  |
| Arsenic (As)                       | 1.0                                   | 1.0  | 1.0                        | 1.0    | 1.0  |
| Barium (Ba)                        | 1.2                                   | 1.0  | 1.5                        | 1.4    | 1.2  |
| Beryllium (Be)                     | 0.2                                   | 1.0  | 1.1                        | 0.3    | 2.8  |
| Cadmium (Cd)                       | 0.5                                   | 1.0  | 0.7                        | 0.4    | 0.9  |
| Calcium (Ca)                       | 2.0                                   | 1.9  | 1.5                        | 1.2    | 1.2  |
| Chromium (Cr)                      | 0.2                                   | 1.0  | -                          | 1.0    | 1.0  |
| Cobalt (Co)                        | 1.0                                   | 1.0  | 1.0                        | 1.0    | 0.9  |
| Copper (Cu)                        | 1.2                                   | 1.1  | 1.2                        | 0.3    | 1.0  |
| Iron (Fe)                          | 1.0                                   | 1.0  | 1.1                        | 1.0    | 1.7  |
| Lead (Pb)                          | 1.0                                   | 1.0  | 0.9                        | 0.6    | 1.0  |
| Lithium (Li)                       | 1.2                                   | 1.1  | 0.4                        | 0.3    |      |
| Magnesium (Mg)                     | 2.0                                   | 1.8  | 1.5                        | 1.2    | 1.2  |
| Manganese (Mn)                     | 3.6                                   | 1.6  | 2.0                        | 1.4    | 0.7  |
| Mercury (Hg)                       | 1.0                                   | 1.0  | 0.5                        | 0.5    | 0.5  |
| Molybdenum (Mo)                    | 3.1                                   | 2.4  | 2.3                        | 2.1    | 1.8  |
| Nickel (Ni)                        | 1.1                                   | 1.2  | 1.2                        | 0.8    | 1.0  |
| Potassium (K)                      | 1.5                                   | 1.3  | -                          | 1.6    | 1.4  |
| Selenium (Se)                      | 0.1                                   | 1.0  | -                          | 0.6    | -    |
| Silicon (Si)                       | 0.9                                   | 0.6  | 1.1                        | 1.0    | 0.8  |
| Silver (Ag)                        | 1.0                                   | 1.0  | 1.1                        | 1.6    | 2.7  |
| Sodium (Na)                        | 2.1                                   | 2.0  | -                          | 2.1    | 1.9  |
| Strontium (Sr)                     | 1.4                                   | 1.2  | 2.1                        | 1.6    | 1.3  |
| Thallium (Tl)                      | 0.1                                   | 1.0  | 1.1                        | 0.1    | -    |
| Tin (Sn)                           | 1.0                                   | 1.0  | 0.1                        | 0.2    | 0.1  |
| Titanium (Ti)                      | 0.1                                   | 1.0  | 1.0                        | 0.1    | 1.0  |
| Uranium (U)                        | 3.9                                   | 3.6  | 2.8                        | 2.7    | 2.4  |
| Vanadium (V)                       | 0.5                                   | 1.0  | 1.0                        | 0.5    | 1.0  |
| Zinc (Zn)                          | 1.8                                   | 1.0  | 4.6                        | 2.2    | 1.3  |

|  |                                                                                                                                                  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).                       |
|  | Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).                    |
|  | Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value). |
|  | Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.            |

Table C.28: Dissolved Metal Concentrations at Camp Lake Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Winter Sampling Event |            |            |            |            |            |            |            |            |            | Spring Sampling Event | Summer Sampling Event |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|-----------------------|------------|------------|------------|------------|------------|
|                  |                 |       | JL0-02                | JL0-02     | JL0-10     | JL0-10     | JL0-01     | JL0-01     | JL0-07     | JL0-07     | JL0-09     | JL0-09     | J0-01                 | JL0-02                | JL0-02     | JL0-10     | JL0-10     | JL0-01     | JL0-01     |
|                  |                 |       | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | outlet                | bottom                | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 12-Apr-20             | 12-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 13-Apr-20  | 14-Apr-20  | 14-Apr-20  | 4-Jul-20              | 29-Jul-20             | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | <0.0030               | 0.0033     | <0.0030    | <0.0030    | <0.0030    | 0.0282     | <0.0030    | <0.0030    | <0.0030    | 0.0171     | 0.0045                | 0.0059                | 0.0046     | 0.0037     | 0.0048     | 0.0028     | 0.0037     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00012    | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | 0.00011               | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00882               | 0.00931    | 0.00883    | 0.00927    | 0.00814    | 0.0101     | 0.00854    | 0.00879    | 0.00910    | 0.0107     | 0.00820               | 0.00710               | 0.00809    | 0.00707    | 0.00732    | 0.00735    | 0.00761    |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Boron (B)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010                | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | 0.000029   | <0.000010  | <0.000010  | <0.000010  | 0.000067   | <0.000010             | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Calcium (Ca)    | mg/L  | 18.8                  | 19.7       | 19.1       | 19.4       | 17.4       | 19.8       | 17.6       | 18.4       | 17.8       | 19.1       | 14.9                  | 14.3                  | 14.0       | 13.5       | 14.4       | 14.8       | 13.9       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | 0.00016               | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00126               | 0.00117    | 0.00099    | 0.00118    | 0.00092    | 0.00211    | 0.00098    | 0.00108    | 0.00109    | 0.00230    | 0.00087               | 0.00085               | 0.00095    | 0.00079    | 0.00081    | 0.00073    | 0.00088    |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030                | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000188   | <0.000050  | <0.000050  | <0.000050  | 0.000539   | <0.000050             | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0018                | 0.0018     | 0.0018     | 0.0018     | 0.0017     | 0.0019     | 0.0016     | 0.0019     | 0.0012     | 0.0014     | 0.0013                | 0.0011                | 0.0012     | 0.0011     | 0.0012     | 0.0011     | 0.0011     |
|                  | Magnesium (Mg)  | mg/L  | 12.0                  | 12.8       | 12.1       | 12.4       | 11.4       | 12.4       | 11.5       | 12.1       | 11.2       | 12.3       | 9.53                  | 8.49                  | 9.05       | 8.36       | 8.41       | 8.85       | 9.07       |
|                  | Manganese (Mn)  | mg/L  | 0.000186              | 0.000222   | 0.000108   | 0.000189   | 0.000214   | 0.00163    | 0.00855    | 0.000143   | 0.000178   | 0.00137    | 0.000986              | 0.00063               | 0.00114    | 0.00052    | 0.00104    | 0.00027    | 0.00105    |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000467              | 0.000478   | 0.000455   | 0.000503   | 0.000426   | 0.000642   | 0.000381   | 0.000474   | 0.000450   | 0.000605   | 0.000399              | 0.000394              | 0.000407   | 0.000383   | 0.000404   | 0.000378   | 0.000392   |
|                  | Nickel (Ni)     | mg/L  | 0.00074               | 0.00082    | 0.00072    | 0.00077    | 0.00068    | 0.00119    | 0.00076    | 0.00072    | 0.00077    | 0.00100    | 0.00068               | 0.00065               | 0.00065    | 0.00058    | 0.00065    | 0.00059    | 0.00069    |
|                  | Potassium (K)   | mg/L  | 1.54                  | 1.65       | 1.54       | 1.62       | 1.42       | 1.65       | 1.42       | 1.54       | 1.53       | 1.73       | 1.34                  | 1.30                  | 1.35       | 1.22       | 1.29       | 1.28       | 1.37       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010               | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Silicon (Si)    | mg/L  | 0.41                  | 0.43       | 0.41       | 0.44       | 0.47       | 0.46       | 1.58       | 0.42       | 0.44       | 0.45       | 0.42                  | 0.386                 | 0.421      | 0.408      | 0.419      | 0.427      | 0.414      |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 2.41                  | 2.60       | 2.46       | 2.53       | 2.25       | 2.74       | 4.04       | 2.43       | 2.35       | 2.68       | 2.02                  | 2.02                  | 2.12       | 1.92       | 2.03       | 1.96       | 2.16       |
|                  | Strontium (Sr)  | mg/L  | 0.0151                | 0.0154     | 0.0151     | 0.0154     | 0.0140     | 0.0162     | 0.0156     | 0.0150     | 0.0150     | 0.0179     | 0.0121                | 0.0111                | 0.0108     | 0.0104     | 0.0110     | 0.0112     | 0.0109     |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00018    | <0.00010              | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010                | <0.00030              | <0.00030   | <0.00030   | <0.00030   | <0.00030   | <0.00030   |
|                  | Uranium (U)     | mg/L  | 0.00131               | 0.00140    | 0.00132    | 0.00135    | 0.00120    | 0.00140    | 0.000938   | 0.00130    | 0.00137    | 0.00154    | 0.00122               | 0.00120               | 0.00134    | 0.00119    | 0.00128    | 0.00125    | 0.00128    |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010               | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0157     | <0.0030    | <0.0030    | <0.0030    | 0.0141     | <0.0030               | 0.0043                | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |

Table C.28: Dissolved Metal Concentrations at Camp Lake Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Summer Sampling Event |            |            |            |            | Fall Sampling Event |            |            |            |            |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                  |                 |       | JL0-07                | JL0-07     | JL0-09     | JL0-09     | J0-01      | JL0-02              | JL0-02     | JL0-10     | JL0-10     | JL0-01     | JL0-01     | JL0-07     | JL0-07     | JL0-09     | JL0-09     |
|                  |                 |       | bottom                | surface    | bottom     | surface    | outlet     | bottom              | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 29-Jul-20             | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 3-Aug-20   | 30-Aug-20           | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  | 30-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0039                | 0.0042     | 0.0037     | 0.0047     | <0.0030    | <0.0030             | <0.0030    | <0.0030    | <0.0030    | 0.0596     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00780               | 0.00759    | 0.00712    | 0.00735    | 0.00777    | 0.00751             | 0.00756    | 0.0075     | 0.00752    | 0.00754    | 0.000359   | 0.00745    | 0.00776    | 0.00746    | 0.00739    |
|                  | Beryllium (Be)  | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L  | 13.7                  | 14.0       | 14.1       | 14.4       | 14.3       | 16.1                | 15.6       | 15.4       | 15.3       | 15.9       | <0.050     | 15.2       | 15.5       | 15.3       | 15.3       |
|                  | Chromium (Cr)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00086               | 0.00089    | 0.00088    | 0.00091    | 0.00091    | 0.0009              | 0.0009     | 0.00087    | 0.00089    | 0.00088    | <0.00050   | 0.00088    | 0.00087    | 0.00088    | 0.00087    |
|                  | Iron (Fe)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | 0.038      | <0.030              | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050           | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0011                | 0.0011     | 0.0012     | 0.0012     | 0.0014     | 0.0013              | 0.0013     | 0.0013     | 0.0013     | 0.0015     | <0.0010    | 0.0013     | 0.0013     | 0.001      | 0.0013     |
|                  | Magnesium (Mg)  | mg/L  | 8.49                  | 8.69       | 8.59       | 8.82       | 9.29       | 10.1                | 9.97       | 9.95       | 9.91       | 9.79       | <0.050     | 9.86       | 9.76       | 9.23       | 9.8        |
|                  | Manganese (Mn)  | mg/L  | 0.00094               | 0.00093    | 0.00090    | 0.00097    | 0.00198    | 0.000177            | 0.000372   | 0.000203   | 0.000309   | 0.000107   | <0.000070  | 0.000302   | 0.000088   | 0.000166   | 0.000178   |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000404              | 0.000392   | 0.000380   | 0.000402   | 0.000398   | 0.00041             | 0.000404   | 0.000402   | 0.00042    | 0.000399   | <0.000050  | 0.000413   | 0.000416   | 0.000426   | 0.00039    |
|                  | Nickel (Ni)     | mg/L  | 0.00062               | 0.00063    | 0.00064    | 0.00064    | 0.00071    | 0.00059             | 0.00061    | 0.00059    | 0.00059    | 0.00059    | <0.00050   | 0.00059    | 0.0006     | 0.0006     | 0.00061    |
|                  | Potassium (K)   | mg/L  | 1.24                  | 1.49       | 1.29       | 1.33       | 1.28       | 1.35                | 1.36       | 1.33       | 1.4        | 1.34       | <0.20      | 1.34       | 1.37       | 1.27       | 1.31       |
|                  | Selenium (Se)   | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 0.424                 | 0.412      | 0.413      | 0.422      | 0.39       | 0.37                | 0.34       | 0.35       | 0.35       | 0.36       | <0.10      | 0.34       | 0.35       | 0.34       | 0.33       |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 2.01                  | 2.22       | 1.99       | 2.04       | 2.02       | 2.43                | 2.3        | 2.28       | 2.19       | 2.27       | <0.050     | 2.21       | 2.22       | 2.05       | 2.2        |
|                  | Strontium (Sr)  | mg/L  | 0.0109                | 0.0113     | 0.0108     | 0.0109     | 0.0110     | 0.0114              | 0.0112     | 0.0113     | 0.0113     | 0.0111     | <0.00010   | 0.0112     | 0.0111     | 0.0117     | 0.011      |
|                  | Thallium (Tl)   | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.00030              | <0.00030   | <0.00030   | <0.00030   | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.00126               | 0.00123    | 0.00123    | 0.00126    | 0.00128    | 0.00147             | 0.00132    | 0.00132    | 0.00133    | 0.00131    | <0.000010  | 0.00132    | 0.00133    | 0.00131    | 0.00129    |
|                  | Vanadium (V)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0010               | 0.0029     | <0.0010    | 0.0010     | <0.0030    | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

**Table C.29: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Camp Lake and Reference Lake 3 in 2020, and Between Camp Lake 2020 and Baseline (2005 to 2013) Data, Mary River Project CREMP**

| Parameter       | Camp Lake vs Reference Lake 3 in 2020 |      | Camp Lake 2020 vs Baseline |        |      |
|-----------------|---------------------------------------|------|----------------------------|--------|------|
|                 | Summer                                | Fall | Winter                     | Summer | Fall |
| Aluminum (Al)   | 0.3                                   | 2.0  | 0.0                        | 0.9    | 2.9  |
| Antimony (Sb)   | 1.0                                   | 1.0  | 0.0                        | 0.0    | 1.0  |
| Arsenic (As)    | 1.0                                   | 1.0  | 1.0                        | 0.8    | 1.0  |
| Barium (Ba)     | 1.2                                   | 1.1  | 0.0                        | 1.4    | 1.2  |
| Beryllium (Be)  | 0.2                                   | 1.0  | 1.2                        | 0.2    | 2.1  |
| Bismuth (Bi)    | 0.1                                   | 1.0  | 1.0                        | 0.0    | 1.0  |
| Boron (B)       | 1.0                                   | 1.0  | 1.0                        | 1.0    | 1.0  |
| Cadmium (Cd)    | 0.5                                   | 1.0  | 0.5                        | 0.0    | 0.8  |
| Calcium (Ca)    | 2.0                                   | 1.9  | 1.4                        | 1.2    | 1.2  |
| Chromium (Cr)   | 0.2                                   | 1.0  | -                          | 0.9    | -    |
| Cobalt (Co)     | 1.0                                   | 1.0  | 1.0                        | 1.0    | 0.9  |
| Copper (Cu)     | 1.2                                   | 1.2  | 1.0                        | 0.6    | 1.0  |
| Iron (Fe)       | 0.3                                   | 1.0  | 1.2                        | 0.4    | 1.7  |
| Lead (Pb)       | 1.0                                   | 1.0  | 0.7                        | 1.0    | 1.0  |
| Lithium (Li)    | 1.1                                   | 1.3  | 0.4                        | 0.0    | 0.5  |
| Magnesium (Mg)  | 2.0                                   | 1.8  | 1.5                        | 1.3    | 1.3  |
| Manganese (Mn)  | 3.7                                   | 1.4  | 2.1                        | 0.0    | 0.3  |
| Mercury (Hg)    | 1.0                                   | 1.0  | 0.5                        | 0.5    | 0.5  |
| Molybdenum (Mo) | 3.0                                   | 2.4  | 2.0                        | 0.0    | 1.9  |
| Nickel (Ni)     | 1.3                                   | 1.2  | 1.1                        | 0.7    | 1.0  |
| Potassium (K)   | 1.5                                   | 1.3  | 1.0                        | 1.2    | 1.0  |
| Selenium (Se)   | 0.1                                   | 1.0  | -                          | 0.5    | -    |
| Silicon (Si)    | 0.9                                   | 0.7  | 1.1                        | 1.0    | 0.8  |
| Silver (Ag)     | 1.0                                   | 1.0  | 1.2                        | 1.8    | 2.7  |
| Sodium (Na)     | 2.3                                   | 2.0  | 1.5                        | 1.6    | 1.6  |
| Strontium (Sr)  | 1.3                                   | 1.3  | 2.0                        | 1.5    | 1.3  |
| Thallium (Tl)   | 0.1                                   | 1.0  | 1.2                        | 0.1    | 2.6  |
| Tin (Sn)        | 1.0                                   | 1.0  | 0.1                        | 0.2    | 0.1  |
| Titanium (Ti)   | 0.0                                   | 1.0  | 1.0                        | 0.0    | 1.0  |
| Uranium (U)     | 4.1                                   | 3.6  | 2.6                        | 2.8    | 2.4  |
| Vanadium (V)    | 0.5                                   | 1.0  | 1.0                        | 0.5    | 1.0  |
| Zinc (Zn)       | 0.6                                   | 1.0  | 2.2                        | 0.6    | 1.9  |

- Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
- Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
- Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).
- Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.

**Table C.30: *In Situ* Water Quality Measurements Collected at Sheardown Lake Tributary 1, Tributary 12, and Tributary 9 Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Study Area                             | Station       | Sampling Date | Temperature (°C) | Dissolved Oxygen (mg/L) | Dissolved Oxygen (% Saturation) | pH (pH units) | Specific Conductance (µS/cm) |
|----------------------------------------|---------------|---------------|------------------|-------------------------|---------------------------------|---------------|------------------------------|
| Unnamed Reference Creek                | REF-CRK-B1    | 10-Aug-20     | 9.9              | 10.42                   | 95.3                            | 7.71          | 132.4                        |
|                                        | REF-CRK-B2    | 10-Aug-20     | 9.0              | 10.61                   | 94.6                            | 7.58          | 132.8                        |
|                                        | REF-CRK-B3    | 10-Aug-20     | 8.4              | 10.68                   | 93.2                            | 7.48          | 132.8                        |
|                                        | REF-CRK-B4    | 10-Aug-20     | 8.0              | 11.09                   | 96.5                            | 7.50          | 130.8                        |
|                                        | REF-CRK-B5    | 10-Aug-20     | 7.6              | 11.30                   | 98.0                            | 7.57          | 133.0                        |
| Sheardown Lake Tributary 1 Reach 1     | SDLT-1-R1-B1  | 17-Aug-20     | 7.7              | 10.41                   | 90.6                            | 7.95          | 451.4                        |
|                                        | SDLT-1-R1-B2  | 17-Aug-20     | 7.6              | 10.55                   | 91.5                            | 7.02          | 430.2                        |
|                                        | SDLT-1-R1-B3  | 17-Aug-20     | 7.3              | 10.78                   | 93.6                            | 7.87          | 440.2                        |
|                                        | SDLT-1-R1-B4  | 17-Aug-20     | 7.1              | 10.87                   | 93.3                            | 7.81          | 417.5                        |
|                                        | SDLT-1-R1-B5  | 17-Aug-20     | 7.0              | 11.00                   | 100.8                           | 7.82          | 419.5                        |
| Sheardown Lake Tributary 12 Downstream | SDLT-12-DS-B1 | 13-Aug-20     | 4.4              | 9.22                    | 77.5                            | 7.79          | 376.2                        |
|                                        | SDLT-12-DS-B2 | 13-Aug-20     | 4.1              | 9.49                    | 76.9                            | 7.83          | 370.0                        |
|                                        | SDLT-12-DS-B3 | 13-Aug-20     | 4.2              | 9.71                    | 74.5                            | 7.82          | 361.7                        |
| Sheardown Lake Tributary 9 Upstream    | SDLT-9-DS-B1  | 13-Aug-20     | 5.3              | 9.26                    | 74.1                            | 7.64          | 275.8                        |
|                                        | SDLT-9-DS-B2  | 13-Aug-20     | 5.3              | 10.25                   | 81.0                            | 7.69          | 284.6                        |
|                                        | SDLT-9-DS-B3  | 13-Aug-20     | 5.3              | 10.91                   | 86.7                            | 7.69          | 284.2                        |
|                                        | SDLT-9-DS-B4  | 13-Aug-20     | 5.3              | 11.35                   | 92.8                            | 7.67          | 283.6                        |
|                                        | SDLT-9-DS-B5  | 13-Aug-20     | 5.7              | 11.35                   | 90.8                            | 7.70          | 283.4                        |



**Table C.31: *In Situ* Water Quality Summary Statistics for the Sheardown Lake Tributary Benthic Stations, Mary River Project CREMP, August 2020**

| Metric                          | Study Area                           | Sample Size | Mean  | Standard Deviation | Standard Error | 95% Confidence Interval |             | Minimum | Maximum |
|---------------------------------|--------------------------------------|-------------|-------|--------------------|----------------|-------------------------|-------------|---------|---------|
|                                 |                                      |             |       |                    |                | Lower Bound             | Upper Bound |         |         |
| Water Temperature (°C)          | Unnamed Reference Creek              | 5           | 8.6   | 0.9                | 0.4            | 7.9                     | 9.2         | 7.6     | 9.9     |
|                                 | Sheardown Lake Tributary 1 (SDLT1)   | 5           | 7.3   | 0.3                | 0.1            | 7.1                     | 7.6         | 7.0     | 7.7     |
|                                 | Sheardown Lake Tributary 12 (SDLT12) | 3           | 4.2   | 0.2                | 0.1            | 4.1                     | 4.4         | 4.1     | 4.4     |
|                                 | Sheardown Lake Tributary 9 (SDLT9)   | 5           | 5.4   | 0.2                | 0.1            | 5.2                     | 5.5         | 5.3     | 5.7     |
| Dissolved Oxygen (mg/L)         | Unnamed Reference Creek              | 5           | 10.82 | 0.36               | 0.16           | 10.55                   | 11.09       | 10.42   | 11.30   |
|                                 | Sheardown Lake Tributary 1 (SDLT1)   | 5           | 10.72 | 0.24               | 0.11           | 10.55                   | 10.90       | 10.41   | 11.00   |
|                                 | Sheardown Lake Tributary 12 (SDLT12) | 3           | 9.47  | 0.25               | 0.14           | 9.24                    | 9.71        | 9.22    | 9.71    |
|                                 | Sheardown Lake Tributary 9 (SDLT9)   | 5           | 10.62 | 0.89               | 0.40           | 9.97                    | 11.28       | 9.26    | 11.35   |
| Dissolved Oxygen (% Saturation) | Unnamed Reference Creek              | 5           | 95.5  | 1.8                | 0.8            | 94.2                    | 96.9        | 93.2    | 98.0    |
|                                 | Sheardown Lake Tributary 1 (SDLT1)   | 5           | 94.0  | 4.0                | 1.8            | 91.0                    | 96.9        | 90.6    | 100.8   |
|                                 | Sheardown Lake Tributary 12 (SDLT12) | 3           | 76.3  | 1.6                | 0.9            | 74.8                    | 77.8        | 74.5    | 77.5    |
|                                 | Sheardown Lake Tributary 9 (SDLT9)   | 5           | 85.1  | 7.6                | 3.4            | 79.5                    | 90.7        | 74.1    | 92.8    |
| pH (units)                      | Unnamed Reference Creek              | 5           | 7.57  | 0.09               | 0.04           | 7.50                    | 7.63        | 7.48    | 7.71    |
|                                 | Sheardown Lake Tributary 1 (SDLT1)   | 5           | 7.69  | 0.38               | 0.17           | 7.41                    | 7.97        | 7.02    | 7.95    |
|                                 | Sheardown Lake Tributary 12 (SDLT12) | 3           | 7.81  | 0.02               | 0.01           | 7.79                    | 7.83        | 7.79    | 7.83    |
|                                 | Sheardown Lake Tributary 9 (SDLT9)   | 5           | 7.68  | 0.02               | 0.01           | 7.66                    | 7.70        | 7.64    | 7.70    |
| Specific Conductance (µS/cm)    | Unnamed Reference Creek              | 5           | 132   | 0.9                | 0.4            | 131.7                   | 133.0       | 130.8   | 133     |
|                                 | Sheardown Lake Tributary 1 (SDLT1)   | 4           | 432   | 14                 | 6              | 421                     | 442         | 418     | 451     |
|                                 | Sheardown Lake Tributary 12 (SDLT12) | 3           | 369   | 7                  | 4              | 362                     | 376         | 362     | 376     |
|                                 | Sheardown Lake Tributary 9 (SDLT9)   | 5           | 282   | 4                  | 2              | 280                     | 285         | 276     | 285     |

**Table C.32: *In Situ* Water Quality Statistical Comparisons Among the Sheardown Lake Tributaries and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                          | Overall 4-group Comparison    |                |                                       |         | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |                        |                                       |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|-----------------------------------------------------|------------------------|---------------------------------------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | (I) Area                                            | (J) Area               | Significant Difference Between Areas? | P-value |
| Water Temperature (°C)          | ANOVA                         | none           | YES                                   | 0.001   | Unnamed Reference Creek                             | Sheardown Tributary 1  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 12 | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 9  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 12 | YES                                   | 0.041   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 9  | YES                                   | 0.041   |
|                                 |                               |                |                                       |         | Sheardown Tributary 12                              | Sheardown Tributary 9  | YES                                   | 0.041   |
| Dissolved Oxygen (mg/L)         | ANOVA                         | none           | YES                                   | 0.019   | Unnamed Reference Creek                             | Sheardown Tributary 1  | YES                                   | 0.018   |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 12 | YES                                   | 0.018   |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 9  | NO                                    | 0.937   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 12 | YES                                   | 0.047   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 9  | YES                                   | 0.047   |
|                                 |                               |                |                                       |         | Sheardown Tributary 12                              | Sheardown Tributary 9  | YES                                   | 0.047   |
| Dissolved Oxygen (% saturation) | ANOVA                         | none           | YES                                   | 0.001   | Unnamed Reference Creek                             | Sheardown Tributary 1  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 12 | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 9  | YES                                   | 0.017   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 12 | YES                                   | 0.098   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 9  | YES                                   | 0.098   |
|                                 |                               |                |                                       |         | Sheardown Tributary 12                              | Sheardown Tributary 9  | YES                                   | 0.098   |
| pH (units)                      | K-W                           | rank           | YES                                   | 0.045   | Unnamed Reference Creek                             | Sheardown Tributary 1  | YES                                   | 0.019   |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 12 | YES                                   | 0.019   |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 9  | NO                                    | 0.374   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 12 | NO                                    | 0.113   |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 9  | NO                                    | 0.113   |
|                                 |                               |                |                                       |         | Sheardown Tributary 12                              | Sheardown Tributary 9  | NO                                    | 0.113   |
| Specific Conductance (µS/cm)    | ANOVA                         | none           | YES                                   | 0.001   | Unnamed Reference Creek                             | Sheardown Tributary 1  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 12 | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Unnamed Reference Creek                             | Sheardown Tributary 9  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 12 | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Sheardown Tributary 1                               | Sheardown Tributary 9  | YES                                   | <0.001  |
|                                 |                               |                |                                       |         | Sheardown Tributary 12                              | Sheardown Tributary 9  | YES                                   | <0.001  |

Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

Table C.33: Water Chemistry at Sheardown Lake Tributary 1 (SDLT1) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Spring Sampling Event |                | Summer Sampling Event |                | Fall Sampling Event |                |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|----------------|-----------------------|----------------|---------------------|----------------|
|                        |                                    |         |                                            |                             | D1-05                 | D1-00          | D1-05                 | D1-00          | DI-05               | DI-00          |
|                        |                                    |         |                                            |                             | 02-Jul-20             | 02-Jul-20      | 03-Aug-20             | 03-Aug-20      | 29-Aug-20           | 29-Aug-20      |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 154                   | 280            | 217                   | 458            | 248                 | 369            |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.92                  | 8.22           | 7.85                  | 8.02           | 7.94                | 8.20           |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 72.5                  | 128            | 98.8                  | 205            | 123                 | 186            |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | 3.2            | <2.0                  | <2.0           | <2.0                | <2.0           |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 99                    | 145            | 117                   | 278            | 130                 | 213            |
|                        | Turbidity                          | NTU     | -                                          | -                           | 6.52                  | 4.22           | 0.32                  | 0.82           | 0.22                | 0.17           |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 64                    | 84             | 98                    | 125            | 99                  | 123            |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010                | <0.010         | <0.010                | <0.010         | <0.010              | <0.010         |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.217                 | 0.614          | 0.219                 | 1.58           | 0.221               | 1.18           |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050        | <0.0050               | <0.0050        | <0.0050             | <0.0050        |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15          | <0.15                 | 0.21           | <0.15               | 0.31           |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.27                  | 3.43           | 3.20                  | 4.33           | 2.96                | 3.24           |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 4.82                  | 4.86           | 4.41                  | 5.46           | 3.25                | 3.58           |
|                        | Total Phosphorus                   | mg/L    | 0.030 <sup>α</sup>                         | -                           | 0.0073                | 0.0043         | <0.0030               | 0.0504         | <0.0030             | <0.0030        |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | 0.0025                | <0.0010        | <0.0010               | <0.0010        | 0.0015              | <0.0010        |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10          | <0.10                 | <0.10          | <0.10               | <0.10          |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 2.45                  | 6.01           | 4.34                  | 11.6           | 6.04                | 10.7           |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 9.47                  | 43.2           | 14.6                  | 89.6           | 16.8                | 47.8           |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179                       | 0.0946                | 0.0946         | 0.0111                | 0.0115         | 0.0077              | 0.0149         |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | <0.00010              | <0.00010       | <0.00010              | <0.00010       | <0.00010            | <0.00010       |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010       | <0.00010              | <0.00010       | <0.00010            | <0.00010       |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00878               | 0.0126         | 0.0110                | 0.0191         | 0.0122              | 0.0171         |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>α</sup>                         | -                           | <0.00050              | <0.00050       | <0.00050              | <0.00050       | <0.00050            | <0.00050       |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050       | <0.00050              | <0.00050       | <0.00050            | <0.00050       |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.011                 | 0.015          | 0.013                 | 0.018          | 0.014               | 0.017          |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00008                     | 0.000035              | 0.000016       | 0.000035              | 0.000015       | 0.000037            | 0.000013       |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 13.1                  | 21.8           | 18.3                  | 35.8           | 22.1                | 32.8           |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.00856                     | <0.00050              | <0.00050       | <0.00050              | <0.00050       | <0.00050            | <0.00050       |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010              | 0.00012        | <0.00010              | 0.00012        | <0.00010            | <0.00010       |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0022                      | <b>0.00321</b>        | <b>0.00253</b> | <b>0.00279</b>        | <b>0.00204</b> | <b>0.00264</b>      | <b>0.00205</b> |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.103                 | 0.159          | <0.030                | 0.147          | <0.030              | 0.092          |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000301              | 0.000167       | <0.000050             | <0.000050      | <0.000050           | <0.000050      |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0014                | 0.0023         | 0.0013                | 0.0026         | 0.0014              | 0.0024         |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 8.90                  | 17.1           | 13.3                  | 28.0           | 16.3                | 24.4           |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00224               | 0.00699        | 0.000675              | 0.0101         | 0.000440            | 0.00541        |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050     | <0.0000050            | <0.0000050     | <0.0000050          | <0.0000050     |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00395               | 0.00306        | 0.00465               | 0.00314        | 0.00556             | 0.00434        |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00153               | 0.00156        | 0.00105               | 0.00152        | 0.00100             | 0.00134        |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 2.25                  | 2.63           | 2.61                  | 3.06           | 2.77                | 3.35           |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010        | <0.0010               | <0.0010        | <0.0010             | <0.0010        |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 1.35                  | 1.42           | 1.35                  | 1.49           | 1.37                | 1.48           |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010      | <0.000010             | <0.000010      | <0.000010           | <0.000010      |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.49                  | 3.42           | 2.32                  | 5.48           | 2.90                | 5.50           |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0112                | 0.0171         | 0.0146                | 0.0254         | 0.0156              | 0.0218         |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010       | <0.00010              | <0.00010       | <0.00010            | <0.00010       |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010       | <0.00010              | <0.00010       | <0.00010            | <0.00010       |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010         | <0.010                | <0.010         | <0.010              | <0.010         |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00281               | 0.00460        | 0.00792               | 0.00786        | 0.0131              | 0.0155         |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010               | <0.0010        | <0.0010               | <0.0010        | <0.0010             | <0.0010        |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0033                | 0.0093         | <0.0030               | 0.0083         | <0.0030             | 0.0067         |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data and adopted from the Camp Lake Tributaries.

**Table C.34: Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between SDLT1 and Reference Creek Stations in 2020, and at SDLT1 Between 2020 and the Baseline Period**

| Parameter                          | 2020 vs Reference Creek |        |      |        | 2020 vs Baseline |      |
|------------------------------------|-------------------------|--------|------|--------|------------------|------|
|                                    | Spring                  | Summer | Fall | Spring | Summer           | Fall |
| Conductivity (lab)                 | 4.0                     | 2.5    | 1.8  | 2.8    | 1.9              | 1.3  |
| Hardness (as CaCO <sub>3</sub> )   | 4.2                     | 2.7    | 1.9  | 2.6    | 1.7              | 1.4  |
| Total Suspended Solids (TSS)       | 0.8                     | 0.7    | 1.0  | 1.3    | 1.0              | 1.0  |
| Total Dissolved Solids (TDS)       | 1.4                     | 2.3    | 1.7  | 2.5    | 1.7              | 1.1  |
| Turbidity                          | 2.9                     | 0.1    | 0.1  | 5.1    | 1.1              | 0.6  |
| Alkalinity (as CaCO <sub>3</sub> ) | 3.1                     | 1.8    | 1.6  | 2.2    | 1.4              | 1.1  |
| Total Ammonia                      | 1.0                     | 0.8    | 1.0  | 0.1    | 0.1              | 0.2  |
| Nitrate                            | 21                      | 15     | 9.2  | 4.3    | 9.1              | 6.4  |
| Nitrite                            | 1.0                     | 1.0    | 1.0  | 1.0    |                  | 0.8  |
| Total Kjeldahl Nitrogen (TKN)      | 7.1                     | 1.2    | 1.5  | 0.9    | 1.2              | 1.9  |
| Dissolved Organic Carbon           | 1.7                     | 1.1    | 1.3  | 0.9    | 1.4              | 1.3  |
| Total Organic Carbon               | 2.2                     | 1.6    | 1.6  | 1.2    | 1.8              | 1.4  |
| Total Phosphorus                   | 1.3                     | 4.1    | 0.8  | 0.5    | 5.8              | 0.7  |
| Phenols                            | 1.8                     | 1.0    | 0.6  |        |                  |      |
| Bromide (Br)                       | 1.0                     | 1.0    | 1.0  | 0.4    |                  |      |
| Chloride (Cl)                      | 3.5                     | 2.0    | 1.2  | 0.6    | 1.9              | 1.0  |
| Sulphate (SO <sub>4</sub> )        | 20                      | 9.4    | 3.5  | 49     | 9.7              | 3.6  |
| Aluminum (Al)                      | 1.2                     | 0.0    | 0.2  | 1.8    | 0.6              | 1.0  |
| Antimony (Sb)                      | 1.0                     | 1.0    | 1.0  | 0.8    | 0.8              | 0.9  |
| Arsenic (As)                       | 1.0                     | 0.8    | 1.0  | 1.0    | 1.0              | 1.0  |
| Barium (Ba)                        | 3.0                     | 1.6    | 1.4  | 2.2    | 1.6              | 1.3  |
| Beryllium (Be)                     | 1.0                     | 1.3    | 1.0  | -      |                  |      |
| Bismuth (Bi)                       | 1.0                     | 1.3    | 1.0  | 1.0    |                  |      |
| Boron (B)                          | 1.3                     | 1.6    | 1.6  | 1.2    | 0.9              | 1.1  |
| Cadmium (Cd)                       | 2.6                     | 2.9    | 2.5  | 1.2    | 0.9              | 1.0  |
| Calcium (Ca)                       | 3.6                     | 2.3    | 1.7  | 2.4    | 1.6              | 1.3  |
| Chromium (Cr)                      | 1.0                     | 0.6    | 1.0  | 2.0    | 2.1              | 3.5  |
| Cobalt (Co)                        | 1.1                     | 0.7    | 1.0  | 0.8    | 1.0              | 0.9  |
| Copper (Cu)                        | 4.0                     | 2.1    | 2.3  | 1.0    | 0.9              | 1.1  |
| Iron (Fe)                          | 1.7                     | 0.4    | 0.9  | 1.4    | 1.3              | 1.5  |
| Lead (Pb)                          | 2.2                     | 0.2    | 0.5  | 0.8    | 0.7              | 0.8  |
| Lithium (Li)                       | 1.9                     | 1.8    | 1.9  | 3.7    | 1.8              | 1.8  |
| Magnesium (Mg)                     | 4.5                     | 3.1    | 2.1  | 2.6    | 1.8              | 1.5  |
| Manganese (Mn)                     | 3.4                     | 1.8    | 2.9  | 2.1    | 2.4              | 2.2  |
| Mercury (Hg)                       | 1.0                     | 1.0    | 1.0  | 0.5    |                  |      |
| Molybdenum (Mo)                    | 24                      | 8.6    | 8.6  | 3.4    | 1.8              | 2.1  |
| Nickel (Ni)                        | 3.1                     | 1.8    | 2.1  | 0.9    | 1.0              | 1.1  |
| Potassium (K)                      | 5.4                     | 3.1    | 2.9  | 2.6    | 1.7              | 1.7  |
| Selenium (Se)                      | 1.0                     | 1.3    | 1.0  |        |                  |      |
| Silicon (Si)                       | 2.2                     | 1.1    | 1.6  | 1.4    | 1.1              | 1.1  |
| Silver (Ag)                        | 1.0                     | 0.5    | 1.0  | 0.9    |                  |      |
| Sodium (Na)                        | 3.0                     | 1.4    | 1.1  | 5.9    | 3.4              | 2.0  |
| Strontium (Sr)                     | 2.9                     | 1.4    | 1.0  | 3.3    | 2.0              | 1.4  |
| Thallium (Tl)                      | 1.0                     | 1.2    | 1.0  | -      | -                | -    |
| Tin (Sn)                           | 1.0                     | 1.0    | 1.0  | 1.0    |                  |      |
| Titanium (Ti)                      | 0.9                     | 0.4    | 1.0  | 1.0    |                  |      |
| Uranium (U)                        | 8.3                     | 2.0    | 1.9  | 5.9    | 3.1              | 2.7  |
| Vanadium (V)                       | 1.0                     | 0.9    | 1.0  | 1.0    |                  |      |
| Zinc (Zn)                          | 2.1                     | 1.9    | 1.6  | 5.9    | 1.5              | 1.9  |

- Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
- Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
- Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).
- Denotes differences in method detection limit between the 2020 and reference area or baseline data, precluding an evaluation of magnitude of elevation

**Table C.35: Dissolved Metal Concentrations at Sheardown Lake Tributary Water Quality Monitoring Stations, Mary River Project CREMP, 2020**

| Parameters       |                 | Units | Spring Sampling Event |            | Summer Sampling Event |            | Fall Sampling Event |            |
|------------------|-----------------|-------|-----------------------|------------|-----------------------|------------|---------------------|------------|
|                  |                 |       | D1-05                 | D1-00      | D1-05                 | D1-00      | D1-05               | DI-00      |
|                  |                 |       | 2-Jul-20              | 2-Jul-20   | 3-Aug-20              | 3-Aug-20   | 29-Aug-20           | 29-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0216                | 0.0181     | 0.0055                | 0.0047     | 0.0063              | 0.0039     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010              | <0.00010   | <0.00010            | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010              | <0.00010   | <0.00010            | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00808               | 0.0125     | 0.0111                | 0.0185     | 0.0119              | 0.0172     |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050              | <0.00050   | <0.00050            | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050              | <0.00050   | <0.00050            | <0.00050   |
|                  | Boron (B)       | mg/L  | 0.012                 | 0.014      | 0.013                 | 0.018      | 0.014               | 0.016      |
|                  | Cadmium (Cd)    | mg/L  | 0.000026              | 0.000013   | 0.000036              | 0.000014   | 0.000038            | 0.000015   |
|                  | Calcium (Ca)    | mg/L  | 14.2                  | 22.9       | 17.8                  | 36.3       | 22.2                | 33.1       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050              | <0.00050   | <0.00050            | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010              | 0.00012    | <0.00010            | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00294               | 0.00236    | 0.00276               | 0.00199    | 0.00264             | 0.00204    |
|                  | Iron (Fe)       | mg/L  | <0.030                | 0.052      | <0.030                | 0.102      | <0.030              | 0.055      |
|                  | Lead (Pb)       | mg/L  | 0.000064              | 0.000063   | <0.000050             | <0.000050  | <0.000050           | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0016                | 0.0022     | 0.0011                | 0.0026     | 0.0015              | 0.0023     |
|                  | Magnesium (Mg)  | mg/L  | 9.02                  | 17.3       | 13.2                  | 27.7       | 16.4                | 25.1       |
|                  | Manganese (Mn)  | mg/L  | 0.000521              | 0.00508    | 0.000585              | 0.00955    | 0.000421            | 0.00483    |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050          | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.00438               | 0.00314    | 0.00442               | 0.00314    | 0.00546             | 0.00430    |
|                  | Nickel (Ni)     | mg/L  | 0.00117               | 0.00142    | 0.00100               | 0.00148    | 0.00102             | 0.00131    |
|                  | Potassium (K)   | mg/L  | 2.19                  | 2.62       | 2.53                  | 3.13       | 2.73                | 3.32       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010               | <0.0010    | <0.0010             | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 1.26                  | 1.29       | 1.31                  | 1.55       | 1.39                | 1.44       |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010             | <0.000010  | <0.000010           | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 1.48                  | 3.45       | 2.33                  | 5.42       | 3.02                | 5.76       |
|                  | Strontium (Sr)  | mg/L  | 0.0115                | 0.0173     | 0.0137                | 0.0243     | 0.0161              | 0.0227     |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010              | <0.00010   | <0.00010            | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010              | <0.00010   | <0.00010            | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010                | <0.010     | <0.010              | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.00291               | 0.00459    | 0.00788               | 0.00788    | 0.0129              | 0.0163     |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010               | <0.0010    | <0.0010             | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | 0.0076     | <0.0030               | 0.0075     | <0.0030             | 0.0061     |

**Table C.36: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020**

| Depth<br>(m)      | Temperature (°C) |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9          | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                 | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                         | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 17-Apr-20        | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 | 17-Apr-20               | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 | 17-Apr-20                       | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 |
| 1.0               | 0.4              | 0.2       | 1.6       | 2.5       | 1.9       | 0.0       | 14.14                   | 14.02     | 13.14     | 13.42     | 13.10     | 14.44     | 98.2                            | 96.4      | 94.4      | 98.3      | 95.3      | 98.9      |
| 2.0               | 0.2              | 0.2       | 0.3       | 0.3       | 0.3       | 0.3       | 14.18                   | 13.90     | 14.00     | 14.50     | 14.04     | 14.15     | 97.8                            | 96.1      | 96.6      | 100.4     | 97.3      | 97.7      |
| 3.0               | 0.7              | 0.5       | 0.7       | 0.6       | 0.8       | 0.4       | 13.89                   | 13.66     | 13.70     | 14.45     | 13.71     | 13.92     | 97.0                            | 95.5      | 96.1      | 100.7     | 96.0      | 97.3      |
| 4.0               | 0.9              | 0.9       | 1.0       | 0.8       | 1.0       | 0.9       | 13.70                   | 13.47     | 13.51     | 14.28     | 13.50     | 13.72     | 96.3                            | 94.9      | 95.1      | 100.1     | 95.0      | 96.5      |
| 5.0               | 1.1              | 1.1       | 1.1       | 0.9       | 1.1       | 1.0       | 13.55                   | 13.34     | 13.40     | 14.18     | 13.37     | 13.61     | 95.6                            | 94.2      | 94.6      | 99.6      | 94.4      | 96.0      |
| 6.0               | 1.1              | 1.1       | 1.1       | 1.0       | 1.2       | 1.1       | 13.55                   | 13.24     | 13.32     | 14.04     | 13.22     | 13.47     | 95.6                            | 93.7      | 94.2      | 98.8      | 93.5      | 95.0      |
| 7.0               | 1.2              | 1.2       | 1.2       | -         | 1.2       | 1.1       | 13.44                   | 13.14     | 13.21     | -         | 13.11     | 13.37     | 95.1                            | 93.1      | 93.5      | -         | 92.9      | 94.5      |
| 8.0               | 1.2              | 1.2       | 1.2       | -         | 1.2       | 1.2       | 13.32                   | 13.07     | 13.03     | -         | 13.04     | 13.28     | 94.4                            | 92.7      | 92.4      | -         | 92.5      | 94.1      |
| 9.0               | 1.2              | 1.3       | 1.3       | -         | 1.3       | 1.2       | 13.16                   | 12.97     | 12.88     | -         | 12.93     | 13.13     | 93.3                            | 92.2      | 91.4      | -         | 91.8      | 93.1      |
| 10.0              | 1.3              | 1.3       | 1.3       | -         | 1.3       | 1.3       | 12.92                   | 12.86     | 12.72     | -         | 12.80     | 12.96     | 91.7                            | 91.5      | 90.5      | -         | 91.0      | 92.1      |
| 11.0              | 1.3              | 1.4       | 1.4       | -         | 1.4       | 1.3       | 12.81                   | 12.71     | 12.57     | -         | 12.60     | 12.78     | 90.9                            | 90.5      | 89.4      | -         | 90.1      | 90.8      |
| 12.0              | -                | 1.4       | 1.4       | -         | 1.4       | -         | -                       | 12.55     | 12.45     | -         | 12.41     | -         | -                               | 89.5      | 88.6      | -         | 88.4      | -         |
| 13.0              | -                | 1.5       | 1.4       | -         | 1.4       | -         | -                       | 12.16     | 12.22     | -         | 12.10     | -         | -                               | 86.8      | 87.2      | -         | 86.3      | -         |
| 14.0              | -                | 1.5       | 1.5       | -         | 1.5       | -         | -                       | 11.89     | 12.02     | -         | 11.78     | -         | -                               | 84.9      | 85.8      | -         | 84.2      | -         |
| 15.0              | -                | 1.6       | 1.5       | -         | 1.5       | -         | -                       | 11.67     | 11.72     | -         | 11.59     | -         | -                               | 83.6      | 83.9      | -         | 82.8      | -         |
| 16.0              | -                | 1.6       | 1.6       | -         | 1.6       | -         | -                       | 11.53     | 11.31     | -         | 11.31     | -         | -                               | 82.7      | 81.1      | -         | 81.0      | -         |
| 17.0              | -                | 1.7       | 1.6       | -         | 1.6       | -         | -                       | 11.16     | 11.07     | -         | 11.06     | -         | -                               | 80.3      | 79.5      | -         | 79.3      | -         |
| 18.0              | -                | 1.7       | 1.7       | -         | -         | -         | -                       | 10.84     | 10.80     | -         | -         | -         | -                               | 78.1      | 77.6      | -         | -         | -         |
| 19.0              | -                | 1.8       | 1.8       | -         | -         | -         | -                       | 10.58     | 10.67     | -         | -         | -         | -                               | 76.3      | 76.9      | -         | -         | -         |
| 20.0              | -                | 1.9       | -         | -         | -         | -         | -                       | 10.25     | -         | -         | -         | -         | -                               | 74.1      | -         | -         | -         | -         |
| 21.0              | -                | 2.0       | -         | -         | -         | -         | -                       | 9.80      | -         | -         | -         | -         | -                               | 71.0      | -         | -         | -         | -         |
| 22.0              | -                | 2.0       | -         | -         | -         | -         | -                       | 8.20      | -         | -         | -         | -         | -                               | 59.5      | -         | -         | -         | -         |
| 23.0              | -                | 2.3       | -         | -         | -         | -         | -                       | 0.80      | -         | -         | -         | -         | -                               | 6.1       | -         | -         | -         | -         |

Notes: Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 9.5, 23.5, 19.7, 6.5, 17.4 and 11.7 m, respectively, at the time of winter sampling. Ice thickness at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 1.40, 1.58, 1.26, 1.43, 1.77, and 1.54 m, respectively, at the time of winter sampling.

**Table C.36: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020**

| Depth<br>(m)      | pH (pH units) |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |
|-------------------|---------------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9       | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                      | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 17-Apr-20     | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 | 17-Apr-20                    | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 |
| 1.0               | 7.93          | 8.13      | 8.04      | 8.10      | 7.85      | 7.81      | 200.5                        | 196.1     | 193.3     | 205.2     | 196.0     | 174.5     |
| 2.0               | 7.87          | 8.01      | 7.90      | 7.93      | 7.86      | 7.78      | 196.8                        | 191.2     | 193.6     | 204.9     | 193.0     | 170.0     |
| 3.0               | 7.82          | 7.91      | 7.84      | 7.81      | 7.80      | 7.77      | 192.2                        | 188.4     | 190.1     | 202.8     | 189.8     | 189.5     |
| 4.0               | 7.80          | 7.87      | 7.81      | 7.73      | 7.75      | 7.77      | 189.8                        | 186.5     | 187.4     | 200.1     | 188.4     | 188.5     |
| 5.0               | 7.78          | 7.80      | 7.80      | 7.70      | 7.74      | 7.76      | 188.3                        | 185.6     | 186.9     | 199.4     | 187.4     | 188.3     |
| 6.0               | 7.77          | 7.82      | 7.78      | 7.67      | 7.73      | 7.75      | 189.3                        | 185.0     | 186.2     | 200.3     | 186.3     | 187.7     |
| 7.0               | 7.76          | 7.80      | 7.77      | -         | 7.72      | 7.74      | 188.3                        | 184.3     | 185.7     | -         | 185.5     | 187.2     |
| 8.0               | 7.76          | 7.79      | 7.77      | -         | 7.71      | 7.74      | 187.1                        | 183.8     | 185.0     | -         | 185.1     | 186.7     |
| 9.0               | 7.75          | 7.78      | 7.76      | -         | 7.70      | 7.73      | 187.0                        | 183.2     | 184.3     | -         | 184.5     | 185.6     |
| 10.0              | 7.73          | 7.77      | 7.75      | -         | 7.70      | 7.73      | 186.9                        | 182.4     | 183.8     | -         | 184.0     | 184.9     |
| 11.0              | 7.73          | 7.75      | 7.74      | -         | 7.68      | 7.72      | 187.0                        | 182.1     | 184.0     | -         | 183.5     | 184.5     |
| 12.0              | -             | 7.74      | 7.73      | -         | 7.67      | -         | -                            | 181.6     | 183.9     | -         | 183.1     | -         |
| 13.0              | -             | 7.72      | 7.72      | -         | 7.65      | -         | -                            | 180.9     | 183.4     | -         | 182.8     | -         |
| 14.0              | -             | 7.69      | 7.70      | -         | 7.63      | -         | -                            | 180.3     | 182.9     | -         | 182.6     | -         |
| 15.0              | -             | 7.67      | 7.68      | -         | 7.60      | -         | -                            | 179.7     | 182.4     | -         | 182.7     | -         |
| 16.0              | -             | 7.66      | 7.67      | -         | 7.57      | -         | -                            | 179.5     | 181.6     | -         | 183.2     | -         |
| 17.0              | -             | 7.64      | 7.64      | -         | 7.54      | -         | -                            | 179.2     | 181.5     | -         | 184       | -         |
| 18.0              | -             | 7.62      | 7.62      | -         | -         | -         | -                            | 179.0     | 180.9     | -         | -         | -         |
| 19.0              | -             | 7.59      | 7.60      | -         | -         | -         | -                            | 178.6     | 180.3     | -         | -         | -         |
| 20.0              | -             | 7.57      | -         | -         | -         | -         | -                            | 178.4     | -         | -         | -         | -         |
| 21.0              | -             | 7.54      | -         | -         | -         | -         | -                            | 178.2     | -         | -         | -         | -         |
| 22.0              | -             | 7.49      | -         | -         | -         | -         | -                            | 179.0     | -         | -         | -         | -         |
| 23.0              | -             | 7.22      | -         | -         | -         | -         | -                            | 193.2     | -         | -         | -         | -         |

Notes: Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 9.5, 23.5, 19.7, 6.5, 17.4 and 11.7 m, respectively, at the time of winter sampling. Ice thickness at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 1.40, 1.58, 1.26, 1.43, 1.77, and 1.54 m, respectively, at the time of winter sampling.



**Table C.37: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020**

| Depth<br>(m)      | Temperature (°C) |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9          | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                 | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                         | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 28-Jul-20        | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 | 28-Jul-20               | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 | 28-Jul-20                       | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 |
| 1.0               | 15.1             | 14.4      | 14.8      | 15.7      | 15.0      | 15.7      | 10.50                   | 10.62     | 10.46     | 10.35     | 10.36     | 10.39     | 104.4                           | 103.9     | 103.4     | 104.3     | 102.7     | 104.6     |
| 2.0               | 14.3             | 14.4      | 14.8      | 15.7      | 14.7      | 15.6      | 10.91                   | 10.63     | 10.49     | 10.36     | 10.53     | 10.39     | 106.6                           | 104.0     | 103.5     | 104.4     | 103.6     | 104.7     |
| 3.0               | 13.3             | 14.2      | 13.6      | 15.7      | 12.7      | 15.5      | 11.39                   | 10.76     | 11.07     | 10.37     | 11.62     | 10.39     | 108.7                           | 104.8     | 108.6     | 104.5     | 109.5     | 104.1     |
| 4.0               | 11.3             | 13.8      | 11.5      | 12.5      | 11.0      | 12.2      | 12.00                   | 10.91     | 11.96     | 11.86     | 12.14     | 11.91     | 109.1                           | 105.4     | 110.0     | 110.9     | 110.1     | 110.2     |
| 5.0               | 10.0             | 10.0      | 10.3      | 10.1      | 10.8      | 9.8       | 12.09                   | 12.21     | 12.25     | 12.23     | 12.02     | 12.17     | 107.2                           | 108.3     | 109.4     | 108.4     | 110.0     | 107.5     |
| 6.0               | 9.6              | 9.5       | 9.7       | -         | 9.8       | 9.5       | 12.00                   | 12.15     | 12.23     | -         | 12.19     | 12.08     | 105.5                           | 106.6     | 107.7     | -         | 107.6     | 105.9     |
| 7.0               | 9.2              | 9.1       | 9.2       | -         | 9.5       | 9.1       | 11.91                   | 11.89     | 12.04     | -         | 12.11     | 11.95     | 103.7                           | 103.2     | 104.8     | -         | 106.1     | 103.7     |
| 8.0               | 8.9              | 8.8       | 8.9       | -         | 9.1       | 8.8       | 11.79                   | 11.79     | 11.90     | -         | 11.95     | 11.86     | 102.0                           | 101.6     | 102.7     | -         | 103.8     | 102.8     |
| 9.0               | -                | 8.6       | 8.4       | -         | 8.0       | 7.8       | -                       | 11.75     | 11.78     | -         | 11.82     | 11.75     | -                               | 100.7     | 100.4     | -         | 99.9      | 98.7      |
| 10.0              | -                | 8.3       | 7.9       | -         | 7.5       | 6.7       | -                       | 11.72     | 11.74     | -         | 11.76     | 11.75     | -                               | 99.7      | 98.9      | -         | 98.2      | 96.0      |
| 11.0              | -                | 7.8       | 7.2       | -         | 6.8       | 6.2       | -                       | 11.72     | 11.77     | -         | 11.75     | 11.74     | -                               | 98.5      | 97.5      | -         | 96.3      | 94.7      |
| 12.0              | -                | 7.1       | 6.4       | -         | 6.4       | -         | -                       | 11.74     | 11.77     | -         | 11.79     | -         | -                               | 96.9      | 95.5      | -         | 95.8      | -         |
| 13.0              | -                | 6.7       | 5.9       | -         | 6.2       | -         | -                       | 11.75     | 11.85     | -         | 11.77     | -         | -                               | 96.1      | 94.9      | -         | 94.7      | -         |
| 14.0              | -                | 6.4       | 5.7       | -         | 5.8       | -         | -                       | 11.78     | 11.82     | -         | 11.78     | -         | -                               | 95.7      | 94.4      | -         | 94.3      | -         |
| 15.0              | -                | 5.9       | 5.6       | -         | 5.8       | -         | -                       | 11.83     | 11.84     | -         | 11.76     | -         | -                               | 94.9      | 94.2      | -         | 93.9      | -         |
| 16.0              | -                | 5.7       | 5.6       | -         | 5.5       | -         | -                       | 11.83     | 11.83     | -         | 11.76     | -         | -                               | 94.3      | 94.0      | -         | 93.3      | -         |
| 17.0              | -                | 5.6       | 5.5       | -         | -         | -         | -                       | 11.82     | 11.83     | -         | -         | -         | -                               | 94.1      | 93.9      | -         | -         | -         |
| 18.0              | -                | 5.6       | 5.5       | -         | -         | -         | -                       | 11.79     | 11.81     | -         | -         | -         | -                               | 93.8      | 93.6      | -         | -         | -         |
| 19.0              | -                | 5.5       | 5.5       | -         | -         | -         | -                       | 11.78     | 11.80     | -         | -         | -         | -                               | 93.5      | 93.5      | -         | -         | -         |
| 20.0              | -                | 5.5       | 5.4       | -         | -         | -         | -                       | 11.77     | 11.79     | -         | -         | -         | -                               | 93.3      | 93.4      | -         | -         | -         |
| 21.0              | -                | 5.5       | 5.4       | -         | -         | -         | -                       | 11.75     | 11.78     | -         | -         | -         | -                               | 93.1      | 93.2      | -         | -         | -         |
| 22.0              | -                | 5.4       | -         | -         | -         | -         | -                       | 11.74     | -         | -         | -         | -         | -                               | 92.9      | -         | -         | -         | -         |
| 23.0              | -                | 5.4       | -         | -         | -         | -         | -                       | 11.72     | -         | -         | -         | -         | -                               | 92.8      | -         | -         | -         | -         |

Note: Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 8.8, 22.9, 22.1, 5.8, 15.8, and 11.3 m, respectively, at the time of summer sampling.



**Table C.37: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020**

| Depth<br>(m)      | pH (pH units) |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |
|-------------------|---------------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9       | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                      | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 28-Jul-20     | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 | 28-Jul-20                    | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 |
| 1.0               | 8.25          | 8.17      | 8.14      | 8.19      | 8.20      | 8.19      | 165.4                        | 163.1     | 163.8     | 164.0     | 163.6     | 165.2     |
| 2.0               | 8.10          | 8.14      | 8.18      | 8.17      | 8.16      | 8.17      | 173.7                        | 163.1     | 163.9     | 163.9     | 164.2     | 164.3     |
| 3.0               | 8.08          | 8.14      | 8.17      | 8.17      | 8.17      | 8.16      | 163.5                        | 162.7     | 161.9     | 164.0     | 159.8     | 163.5     |
| 4.0               | 8.05          | 8.13      | 8.17      | 8.17      | 8.15      | 8.15      | 158.6                        | 162.4     | 157.2     | 160.2     | 157.0     | 159.0     |
| 5.0               | 7.97          | 8.08      | 8.15      | 8.15      | 8.14      | 8.09      | 157.0                        | 156.3     | 157.5     | 158.1     | 156.9     | 156.5     |
| 6.0               | 7.87          | 8.03      | 8.12      | -         | 8.09      | 8.05      | 156.6                        | 156.2     | 156.4     | -         | 156.5     | 156.5     |
| 7.0               | 7.81          | 7.91      | 8.05      | -         | 8.07      | 7.99      | 156.4                        | 155.9     | 156.4     | -         | 156.7     | 156.3     |
| 8.0               | 7.75          | 7.86      | 7.98      | -         | 7.98      | 7.94      | 156.3                        | 155.9     | 155.9     | -         | 156.2     | 156.1     |
| 9.0               | -             | 7.83      | 7.92      | -         | 7.91      | 7.84      | -                            | 155.9     | 156.1     | -         | 156.5     | 155.5     |
| 10.0              | -             | 7.80      | 7.86      | -         | 7.84      | 7.74      | -                            | 155.7     | 155.5     | -         | 155.5     | 155.0     |
| 11.0              | -             | 7.77      | 7.82      | -         | 7.78      | 7.69      | -                            | 155.2     | 155.5     | -         | 154.3     | 154.8     |
| 12.0              | -             | 7.72      | 7.77      | -         | 7.73      | -         | -                            | 155.0     | 154.9     | -         | 154.8     | -         |
| 13.0              | -             | 7.67      | 7.72      | -         | 7.71      | -         | -                            | 154.8     | 155.0     | -         | 154.7     | -         |
| 14.0              | -             | 7.64      | 7.69      | -         | 7.67      | -         | -                            | 154.6     | 154.2     | -         | 154.8     | -         |
| 15.0              | -             | 7.62      | 7.66      | -         | 7.66      | -         | -                            | 154.5     | 154.5     | -         | 154.6     | -         |
| 16.0              | -             | 7.60      | 7.66      | -         | 7.64      | -         | -                            | 154.5     | 154.5     | -         | 154.7     | -         |
| 17.0              | -             | 7.59      | 7.59      | -         | -         | -         | -                            | 154.5     | 154.5     | -         | -         | -         |
| 18.0              | -             | 7.57      | 7.64      | -         | -         | -         | -                            | 154.4     | 154.5     | -         | -         | -         |
| 19.0              | -             | 7.56      | 7.63      | -         | -         | -         | -                            | 154.5     | 154.5     | -         | -         | -         |
| 20.0              | -             | 7.55      | 7.62      | -         | -         | -         | -                            | 154.5     | 154.5     | -         | -         | -         |
| 21.0              | -             | 7.55      | 7.62      | -         | -         | -         | -                            | 154.5     | 154.5     | -         | -         | -         |
| 22.0              | -             | 7.54      | -         | -         | -         | -         | -                            | 154.5     | -         | -         | -         | -         |
| 23.0              | -             | 7.54      | -         | -         | -         | -         | -                            | 154.5     | -         | -         | -         | -         |

Note: Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 8.8, 22.9, 22.1, 5.8, 15.8, and 11.3 m, respectively, at the time of summer sampling.

**Table C.38: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)      | Temperature (°C) |           |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9          | DLO-01-5  | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                 | DLO-01-5  | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                         | DLO-01-5  | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 26-Aug-20        | 27-Aug-20 | 18-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 | 26-Aug-20               | 27-Aug-20 | 18-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 | 26-Aug-20                       | 27-Aug-20 | 18-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 |
| surface           | -                | -         | 8.8       | -         | -         | -         | -         | -                       | -         | 11.21     | -         | -         | -         | -         | -                               | -         | 96.7      | -         | -         | -         | -         |
| 1.0               | 8.5              | 8.4       | 8.8       | 8.4       | 8.3       | 8.4       | 8.4       | 11.49                   | 11.42     | 11.20     | 11.41     | 11.40     | 11.35     | 11.38     | 98.3                            | 97.4      | 96.6      | 97.4      | 97.0      | 96.9      | 97.1      |
| 2.0               | 8.5              | 8.4       | 8.8       | 8.4       | 8.3       | 8.4       | 8.4       | 11.48                   | 11.41     | 11.20     | 11.40     | 11.39     | 11.36     | 11.36     | 98.2                            | 97.3      | 96.5      | 97.3      | 96.9      | 97.0      | 96.9      |
| 3.0               | 8.5              | 8.4       | 8.8       | 8.4       | 8.3       | 8.4       | 8.4       | 11.48                   | 11.40     | 11.19     | 11.41     | 11.38     | 11.36     | 11.36     | 98.2                            | 97.2      | 96.5      | 97.4      | 96.8      | 97.0      | 96.9      |
| 4.0               | 8.5              | 8.4       | 8.8       | 8.4       | 8.3       | 8.4       | 8.4       | 11.48                   | 11.39     | 11.19     | 11.39     | 11.37     | 11.35     | 11.35     | 98.1                            | 97.2      | 96.5      | 97.2      | 96.7      | 96.9      | 96.9      |
| 5.0               | 8.5              | 8.4       | 8.8       | 8.4       | 8.3       | 8.4       | 8.4       | 11.47                   | 11.40     | 11.18     | 11.38     | 11.36     | 11.35     | 11.34     | 98.1                            | 97.2      | 96.4      | 97.1      | 96.6      | 96.9      | 96.8      |
| 6.0               | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | 8.4       | -                       | 11.38     | 11.18     | 11.38     | -         | 11.34     | 11.33     | -                               | 97.1      | 96.4      | 97.1      | -         | 96.8      | 96.7      |
| 7.0               | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | 8.4       | -                       | 11.38     | 11.17     | 11.37     | -         | 11.33     | 11.32     | -                               | 97.0      | 96.3      | 97.0      | -         | 96.8      | 96.6      |
| 8.0               | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | 8.4       | -                       | 11.37     | 11.17     | 11.37     | -         | 11.33     | 11.32     | -                               | 97.0      | 96.3      | 97.0      | -         | 96.7      | 96.6      |
| 9.0               | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | 8.4       | -                       | 11.36     | 11.16     | 11.36     | -         | 11.32     | 11.31     | -                               | 96.8      | 96.2      | 96.9      | -         | 96.6      | 96.5      |
| 10.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | 8.4       | -                       | 11.35     | 11.16     | 11.35     | -         | 11.31     | 11.30     | -                               | 96.8      | 96.2      | 96.8      | -         | 96.5      | 96.5      |
| 11.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.34     | 11.15     | 11.34     | -         | 11.31     | -         | -                               | 96.7      | 96.1      | 96.8      | -         | 96.5      | -         |
| 12.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.34     | 11.15     | 11.34     | -         | 11.31     | -         | -                               | 96.7      | 96.1      | 96.8      | -         | 96.5      | -         |
| 13.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.33     | 11.14     | 11.34     | -         | 11.30     | -         | -                               | 96.6      | 96.0      | 96.7      | -         | 96.4      | -         |
| 14.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.33     | 11.14     | 11.33     | -         | 11.30     | -         | -                               | 96.5      | 96.0      | 96.6      | -         | 96.4      | -         |
| 15.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.32     | 11.13     | 11.32     | -         | 11.28     | -         | -                               | 96.5      | 95.9      | 96.5      | -         | 96.2      | -         |
| 16.0              | -                | 8.4       | 8.8       | 8.4       | -         | 8.4       | -         | -                       | 11.31     | 11.13     | 11.31     | -         | 11.23     | -         | -                               | 96.5      | 95.9      | 96.4      | -         | 95.9      | -         |
| 17.0              | -                | 8.4       | 8.8       | -         | -         | -         | -         | -                       | 11.30     | 11.12     | -         | -         | -         | -         | -                               | 96.4      | 95.8      | -         | -         | -         | -         |
| 18.0              | -                | 8.4       | 8.8       | -         | -         | -         | -         | -                       | 11.30     | 11.12     | -         | -         | -         | -         | -                               | 96.4      | 95.8      | -         | -         | -         | -         |
| 19.0              | -                | 8.4       | 8.8       | -         | -         | -         | -         | -                       | 11.29     | 11.11     | -         | -         | -         | -         | -                               | 97.3      | 95.7      | -         | -         | -         | -         |
| 20.0              | -                | 8.4       | 8.8       | -         | -         | -         | -         | -                       | 11.30     | 11.11     | -         | -         | -         | -         | -                               | 96.3      | 95.7      | -         | -         | -         | -         |
| 21.0              | -                | 8.4       | 8.8       | -         | -         | -         | -         | -                       | 11.29     | 11.10     | -         | -         | -         | -         | -                               | 96.3      | 95.6      | -         | -         | -         | -         |
| 22.0              | -                | -         | 8.8       | -         | -         | -         | -         | -                       | -         | 11.10     | -         | -         | -         | -         | -                               | -         | 95.6      | -         | -         | -         | -         |
| 23.0              | -                | -         | 8.8       | -         | -         | -         | -         | -                       | -         | 11.09     | -         | -         | -         | -         | -                               | -         | 95.5      | -         | -         | -         | -         |

Notes: 18-Aug-20 sampling was conducted by Minnow. Sheardown Lake NW water profile sampling on all other dates was conducted by Baffinland. Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 9.9, 22.2, 17.6, 6.7 , 18.2, and 11.4 m, respectively, at the time of fall sampling.

**Table C.38: *In Situ* Water Quality Profile Data Collected at Sheardown Lake NW Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)      | pH (pH units) |           |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |           |
|-------------------|---------------|-----------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
|                   | DD Hab9       | DLO-01-5  | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  | DD Hab9                      | DLO-01-5  | DLO-01-5  | DLO-01-1  | DLO-01-4  | DLO-01-2  | DLO-01-7  |
| Date<br>Collected | 26-Aug-20     | 27-Aug-20 | 18-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 | 26-Aug-20                    | 27-Aug-20 | 18-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 |
| surface           | -             | -         | 8.03      | -         | -         | -         | -         | -                            | -         | 162.1     | -         | -         | -         | -         |
| 1.0               | 8.08          | 8.06      | 8.03      | 8.06      | 8.04      | 8.01      | 8.00      | 164.0                        | 163.6     | 162.0     | 163.6     | 164.3     | 163.5     | 163.4     |
| 2.0               | 8.07          | 8.06      | 8.04      | 8.06      | 8.04      | 8.01      | 8.02      | 163.8                        | 163.6     | 162.1     | 163.6     | 164.2     | 163.5     | 163.4     |
| 3.0               | 8.07          | 8.06      | 8.03      | 8.06      | 8.03      | 8.00      | 8.02      | 163.8                        | 163.6     | 162.1     | 163.7     | 164.2     | 163.5     | 163.4     |
| 4.0               | 8.07          | 8.05      | 8.04      | 8.06      | 8.03      | 8.01      | 8.02      | 164.1                        | 163.6     | 162.1     | 163.7     | 164.2     | 163.6     | 163.5     |
| 5.0               | 8.07          | 8.06      | 8.04      | 8.06      | 8.04      | 8.01      | 8.02      | 164.8                        | 163.6     | 162.1     | 163.7     | 164.2     | 163.5     | 163.4     |
| 6.0               | -             | 8.06      | 8.03      | 8.06      | -         | 8.01      | 8.02      | -                            | 163.6     | 162.1     | 163.7     | -         | 163.6     | 163.4     |
| 7.0               | -             | 8.06      | 8.03      | 8.06      | -         | 8.01      | 8.02      | -                            | 163.6     | 162.1     | 163.8     | -         | 163.6     | 163.4     |
| 8.0               | -             | 8.06      | 8.03      | 8.06      | -         | 8.01      | 8.02      | -                            | 163.6     | 162.1     | 163.8     | -         | 163.5     | 163.4     |
| 9.0               | -             | 8.06      | 8.03      | 8.06      | -         | 8.01      | 8.02      | -                            | 163.7     | 162.1     | 163.9     | -         | 163.5     | 163.4     |
| 10.0              | -             | 8.05      | 8.03      | 8.05      | -         | 8.01      | 8.02      | -                            | 163.7     | 162.1     | 163.9     | -         | 163.5     | 163.4     |
| 11.0              | -             | 8.05      | 8.03      | 8.06      | -         | 8.01      | -         | -                            | 163.7     | 162.1     | 163.9     | -         | 163.6     | -         |
| 12.0              | -             | 8.05      | 8.03      | 8.06      | -         | 8.01      | -         | -                            | 163.7     | 162.1     | 163.8     | -         | 163.5     | -         |
| 13.0              | -             | 8.05      | 8.03      | 8.06      | -         | 8.01      | -         | -                            | 163.7     | 162.0     | 163.9     | -         | 163.6     | -         |
| 14.0              | -             | 8.04      | 8.02      | 8.05      | -         | 8.01      | -         | -                            | 163.7     | 162.1     | 163.9     | -         | 163.5     | -         |
| 15.0              | -             | 8.04      | 8.02      | 8.05      | -         | 8.01      | -         | -                            | 163.7     | 162.0     | 163.9     | -         | 163.5     | -         |
| 16.0              | -             | 8.04      | 8.02      | 8.05      | -         | 7.99      | -         | -                            | 163.7     | 162.0     | 164.0     | -         | 163.5     | -         |
| 17.0              | -             | 8.04      | 8.01      | -         | -         | -         | -         | -                            | 163.7     | 162.0     | -         | -         | -         | -         |
| 18.0              | -             | 8.03      | 8.01      | -         | -         | -         | -         | -                            | 163.7     | 162.0     | -         | -         | -         | -         |
| 19.0              | -             | 8.03      | 8.01      | -         | -         | -         | -         | -                            | 163.7     | 162.0     | -         | -         | -         | -         |
| 20.0              | -             | 8.06      | 8.00      | -         | -         | -         | -         | -                            | 163.7     | 162.0     | -         | -         | -         | -         |
| 21.0              | -             | 8.06      | 8.00      | -         | -         | -         | -         | -                            | 163.7     | 162.0     | -         | -         | -         | -         |
| 22.0              | -             | -         | 8.00      | -         | -         | -         | -         | -                            | -         | 162.0     | -         | -         | -         | -         |
| 23.0              | -             | -         | 8.00      | -         | -         | -         | -         | -                            | -         | 161.9     | -         | -         | -         | -         |

Notes: 18-Aug-20 sampling was conducted by Minnow. Sheardown Lake NW water profile sampling on all other dates was conducted by Baffinland. Total depth at stations DD Hab9, DLO-01-5, DLO-01-1, DLO-01-4, DLO-01-2, and DLO-01-7 was 9.9, 22.2, 17.6, 6.7 , 18.2, and 11.4 m, respectively, at the time of fall sampling.

**Table C.39: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Sheardown Lake NW Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Categorization & Replicate ID |           | Date Sampled | Station Depth (m) | Secchi Depth (m) | Depth sampled | Temperature (°C) | Dissolved Oxygen |          | pH (units) | Specific Conductance (µS/cm) |
|-------------------------------|-----------|--------------|-------------------|------------------|---------------|------------------|------------------|----------|------------|------------------------------|
|                               |           |              |                   |                  |               |                  | (mg/L)           | (% sat.) |            |                              |
| Littoral (Shallow) Stations   | DLO-01-9  | 18-Aug-2020  | 7.6               | 4.53             | surface       | 8.5              | 11.30            | 96.7     | 8.02       | 161.4                        |
|                               |           |              |                   |                  | bottom        | 8.6              | 11.26            | 96.4     | 8.00       | 161.7                        |
|                               | DLO-01-4  | 18-Aug-2020  | 7.5               | 4.53             | surface       | 8.5              | 11.29            | 96.6     | 8.00       | 160.8                        |
|                               |           |              |                   |                  | bottom        | 8.5              | 11.25            | 96.3     | 7.99       | 160.7                        |
|                               | DLO-01-3  | 18-Aug-2020  | 8.2               | 3.88             | surface       | 8.7              | 11.22            | 96.5     | 7.95       | 161.7                        |
|                               |           |              |                   |                  | bottom        | 8.7              | 11.19            | 96.2     | 7.93       | 161.8                        |
|                               | DLO-01-11 | 18-Aug-2020  | 8.2               | 5.28             | surface       | 8.6              | 11.20            | 96.2     | 7.88       | 161.2                        |
|                               |           |              |                   |                  | bottom        | 8.6              | 11.10            | 95.9     | 7.88       | 160.9                        |
|                               | DLO-01-10 | 18-Aug-2020  | 7.9               | 4.10             | surface       | 8.6              | 11.18            | 95.8     | 7.81       | 161.0                        |
|                               |           |              |                   |                  | bottom        | 8.6              | 11.15            | 95.6     | 7.77       | 160.9                        |
| Profundal (Deep) Stations     | DLO-01-5  | 15-Aug-2020  | 23.3              | 4.37             | surface       | 10.4             | 10.39            | 95.3     | 7.87       | 159.9                        |
|                               |           |              |                   |                  | bottom        | 5.5              | 10.94            | 89.1     | 7.31       | 151.4                        |
|                               | DLO-01-14 | 15-Aug-2020  | 22.0              | 5.14             | surface       | 10.4             | 10.19            | 93.1     | 7.86       | 159.8                        |
|                               |           |              |                   |                  | bottom        | 5.5              | 10.82            | 88.2     | 7.27       | 151.3                        |
|                               | DLO-01-15 | 15-Aug-2020  | 21.7              | 4.91             | surface       | 10.3             | 10.36            | 94.7     | 7.69       | 159.8                        |
|                               |           |              |                   |                  | bottom        | 5.7              | 10.78            | 88.2     | 7.18       | 151.5                        |
|                               | DLO-01-2  | 18-Aug-2020  | 17.5              | -                | surface       | 8.8              | 11.20            | 96.5     | 7.98       | 162.0                        |
|                               |           |              |                   |                  | bottom        | 8.7              | 11.10            | 95.5     | 7.96       | 161.8                        |
|                               | DLO-01-12 | 15-Aug-2020  | 14.0              | 5.41             | surface       | 10.1             | 10.51            | 95.8     | 7.84       | 159.7                        |
|                               |           |              |                   |                  | bottom        | 6.5              | 11.23            | 94.0     | 7.47       | 152.1                        |

Note: "-" indicates no available data.

**Table C.40: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake NW Littoral and Profundal Stations, Mary River Project CREMP, August 2020**

| Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |             |       |                    |                |         |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|-------------|-------|--------------------|----------------|---------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Lake Zone          | Sample Size | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Secchi Depth (m)                | tequal                        | none           | NO                                    | 0.183   | Littoral           | 5           | 4.46  | 0.54               | 0.24           | 3.88    | 5.28    |
|                                 |                               |                |                                       |         | Profundal          | 4           | 4.96  | 0.44               | 0.22           | 4.37    | 5.41    |
| Temperature (°C)                | M-W                           | rank           | NO                                    | 0.110   | Littoral           | 5           | 8.60  | 0.07               | 0.03           | 8.50    | 8.70    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 6.38  | 1.36               | 0.61           | 5.50    | 8.70    |
| Dissolved Oxygen (mg/L)         | tequal                        | none           | YES                                   | 0.043   | Littoral           | 5           | 11.2  | 0.1                | 0.0            | 11.1    | 11.3    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 11.0  | 0.2                | 0.1            | 10.8    | 11.2    |
| Dissolved Oxygen (% saturation) | tequal                        | none           | YES                                   | 0.012   | Littoral           | 5           | 96.1  | 0.3                | 0.1            | 95.6    | 96.4    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 91.0  | 3.5                | 1.6            | 88.2    | 95.5    |
| pH (units)                      | tequal                        | none           | YES                                   | 0.011   | Littoral           | 5           | 7.91  | 0.09               | 0.04           | 7.77    | 8.00    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 7.44  | 0.31               | 0.14           | 7.18    | 7.96    |
| Specific Conductance (umho/cm)  | M-W                           | rank           | NO                                    | 0.115   | Littoral           | 5           | 161.2 | 0.5                | 0.2            | 160.7   | 161.8   |
|                                 |                               |                |                                       |         | Profundal          | 5           | 153.6 | 4.6                | 2.0            | 151.3   | 161.8   |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).

**Table C.41: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake NW and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |                 |       |                    |                |         |         |
|-----------------------------|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|-----------------|-------|--------------------|----------------|---------|---------|
|                             |                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Station Depth (m)               | tequal                        | none           | YES                                   | 0.004   | Reference          | 4               | 10.0  | 1.1                | 0.5            | 8.5     | 11.0    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 7.9   | 0.3                | 0.1            | 7.5     | 8.2     |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 8.12  | 0.64               | 0.29           | 7.38    | 9.15    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 4.46  | 0.54               | 0.24           | 3.88    | 5.28    |
|                             | Temperature (°C)                | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 9.32  | 0.29               | 0.13           | 8.90    | 9.70    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 8.60  | 0.07               | 0.03           | 8.50    | 8.70    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | none           | YES                                   | 0.002   | Reference          | 5               | 12.6  | 0.7                | 0.3            | 11.8    | 13.3    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 11.2  | 0.1                | 0.0            | 11.1    | 11.3    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 111.9 | 5.2                | 2.3            | 104.6   | 116.7   |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 96.1  | 0.3                | 0.1            | 95.6    | 96.4    |
| Profundal (Deep) Stations   | pH (units)                      | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 7.19  | 0.23               | 0.10           | 6.94    | 7.56    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 7.91  | 0.09               | 0.04           | 7.77    | 8.00    |
|                             | Specific Conductance (umho/cm)  | M-W                           | rank           | YES                                   | 0.012   | Reference          | 5               | 76.7  | 3.2                | 1.4            | 74.5    | 82.1    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 161.2 | 0.5                | 0.2            | 160.7   | 161.8   |
|                             | Station Depth (m)               | tequal                        | none           | NO                                    | 0.642   | Reference          | 5               | 20.6  | 1.6                | 0.7            | 19.0    | 23.0    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 19.7  | 3.9                | 1.7            | 14.0    | 23.3    |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 8.39  | 0.96               | 0.43           | 7.18    | 9.84    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 4               | 4.96  | 0.44               | 0.22           | 4.37    | 5.41    |
|                             | Temperature (°C)                | M-W                           | rank           | NO                                    | 0.916   | Reference          | 5               | 5.82  | 0.19               | 0.09           | 5.60    | 6.10    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 6.38  | 1.36               | 0.61           | 5.50    | 8.70    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | log10          | YES                                   | 0.008   | Reference          | 5               | 13.6  | 1.3                | 0.6            | 12.8    | 15.8    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 11.0  | 0.2                | 0.1            | 10.8    | 11.2    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | log10          | YES                                   | 0.002   | Reference          | 5               | 110.6 | 10.3               | 4.6            | 103.5   | 127.9   |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 91.0  | 3.5                | 1.6            | 88.2    | 95.5    |
|                             | pH (units)                      | tequal                        | none           | YES                                   | 0.005   | Reference          | 5               | 6.70  | 0.30               | 0.13           | 6.27    | 6.95    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 7.44  | 0.31               | 0.14           | 7.18    | 7.96    |
|                             | Specific Conductance (umho/cm)  | M-W                           | rank           | YES                                   | 0.008   | Reference          | 5               | 75.5  | 1.6                | 0.7            | 74.0    | 78.1    |
|                             |                                 |                               |                |                                       |         | Sheardown NW       | 5               | 153.6 | 4.6                | 2.0            | 151.3   | 161.8   |

Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).

Table C.42: Water Chemistry at Sheardown Lake NW (DLO-01) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Winter Sampling Event |                      |                 |                  |                 |                  |                 |                  |                 |                  |                 |                  |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|----------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
|                        |                                    |         |                                            |                             | DD-HAB9-STN1 bottom   | DD-HAB9-STN1 surface | DL0-01-5 bottom | DL0-01-5 surface | DL0-01-1 bottom | DL0-01-1 surface | DL0-01-4 bottom | DL0-01-4 surface | DL0-01-2 bottom | DL0-01-2 surface | DL0-01-7 bottom | DL0-01-7 surface |
|                        |                                    |         |                                            |                             | 17-Apr-20             | 17-Apr-20            | 17-Apr-20       | 17-Apr-20        | 17-Apr-20       | 17-Apr-20        | 16-Apr-20       | 16-Apr-20        | 17-Apr-20       | 17-Apr-20        | 15-Apr-20       | 15-Apr-20        |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 187                   | 197                  | 179             | 193              | 182             | 196              | 197             | 203              | 182             | 193              | 187             | 194              |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.69                  | 7.70                 | 7.49            | 7.71             | 7.50            | 7.72             | 7.67            | 7.70             | 7.54            | 7.70             | 7.66            | 7.70             |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 96.3                  | 105                  | 92.4            | 97.7             | 91.3            | 97.5             | 102             | 102              | 90.9            | 94.9             | 96.5            | 102              |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0                 | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 115                   | 118                  | 107             | 107              | 112             | 112              | 130             | 124              | 107             | 100              | 139             | 141              |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.18                  | <0.10                | <0.10           | <0.10            | 0.12            | 0.17             | 0.13            | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 75                    | 78                   | 71              | 75               | 70              | 78               | 81              | 83               | 73              | 78               | 71              | 74               |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.028                 | 0.031                | <0.010          | 0.029            | <0.010          | 0.028            | 0.036           | 0.031            | 0.012           | 0.028            | 0.028           | 0.032            |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.196                 | 0.201                | 0.249           | 0.196            | 0.243           | 0.197            | 0.202           | 0.209            | 0.223           | 0.194            | 0.194           | 0.226            |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050              | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.19                  | 0.23                 | <0.15           | 0.19             | <0.15           | <0.15            | 0.17            | 0.18             | 0.16            | 0.20             | <0.15           | <0.15            |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.74                  | 2.83                 | 2.73            | 2.51             | 2.46            | 2.78             | 2.74            | 2.75             | 2.38            | 3.05             | 2.89            | 2.61             |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 3.61                  | 3.98                 | 3.50            | 3.40             | 4.25            | 4.59             | 4.42            | 4.15             | 4.18            | 4.30             | 2.54            | 2.65             |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0113                | <0.0030              | 0.0112          | <0.0030          | 0.0249          | <0.0030          | 0.0045          | 0.0079           | <0.0030         | 0.0038           | <0.0030         | 0.0043           |
| Anions                 | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | <0.0010               | <0.0010              | <0.0010         | <0.0010          | 0.0029          | 0.0029           | 0.0025          | 0.0020           | 0.0024          | 0.0013           | <0.0010         | <0.0010          |
|                        | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10                | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 5.09                  | 5.39                 | 4.86            | 5.22             | 4.93            | 5.29             | 5.54            | 5.59             | 4.98            | 5.27             | 5.11            | 5.39             |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 16.8                  | 17.6                 | 15.8            | 17.1             | 16.1            | 17.4             | 18.0            | 18.3             | 16.3            | 17.3             | 16.8            | 17.6             |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | <0.0030               | 0.0037               | <0.0030         | 0.0035           | 0.0062          | <0.0030          | <0.0030         | 0.0046           | <0.0030         | 0.0162           | <0.0030         | 0.0035           |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010              | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00890               | 0.00939              | 0.00853         | 0.00918          | 0.00865         | 0.00930          | 0.00943         | 0.00958          | 0.00865         | 0.00927          | 0.00955         | 0.00990          |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00050              | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.012                 | 0.012                | 0.011           | 0.012            | 0.011           | 0.012            | 0.011           | 0.012            | 0.011           | 0.011            | 0.011           | 0.012            |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.000010             | <0.000010            | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | 0.000010         | <0.000010       | <0.000010        |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 19.0                  | 19.3                 | 17.7            | 19.0             | 17.0            | 19.6             | 19.0            | 20.4             | 18.1            | 18.9             | 18.3            | 18.3             |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | <0.00010              | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00090               | 0.00093              | 0.00090         | 0.00093          | 0.00088         | 0.00091          | 0.00092         | 0.00096          | 0.00082         | 0.00128          | 0.00099         | 0.00105          |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | <0.030                | <0.030               | <0.030          | <0.030           | <0.030          | <0.030           | <0.030          | <0.030           | <0.030          | <0.030           | <0.030          | <0.030           |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050            | <0.000050       | <0.000050        | <0.000050       | <0.000050        | <0.000050       | <0.000050        | <0.000050       | 0.000096         | <0.000050       | <0.000050        |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0015                | 0.0016               | 0.0015          | 0.0016           | 0.0014          | 0.0016           | 0.0014          | 0.0016           | 0.0016          | 0.0015           | 0.0014          | 0.0015           |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 11.6                  | 12.2                 | 11.1            | 11.9             | 11.0            | 11.6             | 12.3            | 12.5             | 11.1            | 11.9             | 12.6            | 13.1             |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.000548              | 0.000542             | 0.00105         | 0.000428         | 0.00126         | 0.000476         | 0.000632        | 0.000543         | 0.000926        | 0.00119          | 0.000755        | 0.000626         |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050           | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       | 0.0000059       | <0.0000050       | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.00121               | 0.00124              | 0.00109         | 0.00121          | 0.00106         | 0.00123          | 0.00126         | 0.00127          | 0.00109         | 0.00134          | 0.00117         | 0.00123          |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00076               | 0.00079              | 0.00073         | 0.00077          | 0.00072         | 0.00080          | 0.00080         | 0.00086          | 0.00071         | 0.00092          | 0.00089         | 0.00090          |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.61                  | 1.70                 | 1.51            | 1.66             | 1.52            | 1.66             | 1.71            | 1.74             | 1.51            | 1.65             | 1.67            | 1.73             |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010              | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.56                  | 0.57                 | 0.81            | 0.55             | 0.75            | 0.56             | 0.57            | 0.59             | 0.65            | 0.56             | 0.63            | 0.60             |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010            | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 2.20                  | 2.32                 | 2.05            | 2.27             | 2.08            | 2.24             | 2.32            | 2.38             | 2.07            | 2.25             | 2.39            | 2.45             |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0129                | 0.0138               | 0.0121          | 0.0131           | 0.0121          | 0.0133           | 0.0137          | 0.0138           | 0.0124          | 0.0128           | 0.0137          | 0.0142           |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010               | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00139               | 0.00146              | 0.00126         | 0.00146          | 0.00133         | 0.00144          | 0.00149         | 0.00154          | 0.00134         | 0.00143          | 0.00146         | 0.00150          |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | <0.0010               | <0.0010              | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030              | <0.0030         | <0.0030          | <0.0030         | <0.0030          | <0.0030         | <0.0030          | <0.0030         | 0.0088           | <0.0030         | <0.0030          |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.



Table C.42: Water Chemistry at Sheardown Lake NW (DLO-01) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |              |            |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | DD-HAB9-STN1          | DD-HAB9-STN1 | DL0-01-5   | DL0-01-5   | DL0-01-1   | DL0-01-1   | DL0-01-4   | DL0-01-4   | DL0-01-2   | DL0-01-2   | DL0-01-7   | DL0-01-7   |
|                        |                                    |         |                                            |                             | bottom                | surface      | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 28-Jul-20             | 28-Jul-20    | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  | 28-Jul-20  | 28-Jul-20  | 29-Jul-20  | 29-Jul-20  | 28-Jul-20  | 28-Jul-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 160                   | 167          | 158        | 166        | 161        | 168        | 161        | 166        | 163        | 167        | 158        | 168        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.95                  | 8.10         | 7.69       | 8.14       | 7.67       | 8.18       | 8.14       | 8.15       | 7.68       | 8.17       | 7.85       | 8.17       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 71.9                  | 73           | 74.7       | 77.3       | 74.3       | 75.3       | 75.9       | 78.6       | 76         | 77.3       | 74         | 80.3       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0         | <2.0       | <2.0       | 2.1        | <2.0       | <2.0       | <2.0       | 8.0        | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 80                    | 100          | 91         | 93         | 99         | 104        | 87         | 107        | 93         | 93         | 80         | 85         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 1.04                  | 0.76         | 0.87       | 0.65       | 0.94       | 0.78       | 0.90       | 0.77       | 1.01       | 0.69       | 0.88       | 0.77       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 57.6                  | 60.0         | 57.3       | 60.0       | 58.5       | 60.1       | 57.4       | 61.1       | 58.8       | 59.9       | 58.6       | 60.1       |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.0050               | <0.0050      | 0.0063     | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.204                 | 0.260        | 0.212      | 0.221      | 0.207      | 0.221      | 0.199      | 0.241      | 0.212      | 0.222      | 0.213      | 0.219      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0010               | 0.0020       | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0011     | 0.0023     | <0.0010    | <0.0010    | <0.0010    | 0.0023     |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.122                 | 0.127        | 0.105      | 0.116      | 0.120      | 0.130      | 0.127      | 0.122      | 0.120      | 0.148      | 0.115      | 0.108      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.58                  | 1.97         | 1.52       | 2.01       | 1.67       | 1.90       | 1.55       | 1.89       | 1.92       | 2.08       | 1.55       | 1.64       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 1.55                  | 1.92         | 1.78       | 1.76       | 1.81       | 1.81       | 1.65       | 1.91       | 1.73       | 2.06       | 1.66       | 1.84       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0057                | 0.0054       | 0.0026     | 0.0022     | 0.0044     | 0.0042     | 0.0046     | 0.0094     | 0.0028     | 0.0028     | 0.0041     | 0.0060     |
|                        | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | 0.0025                | 0.0023       | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0021     | 0.0033     | <0.0010    | <0.0010    | 0.0024     | 0.0026     |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.050                | <0.050       | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 4.21                  | 4.37         | 4.07       | 4.21       | 4.08       | 4.25       | 4.24       | 4.40       | 4.18       | 4.25       | 4.21       | 4.50       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 14.5                  | 15.7         | 13.4       | 14.7       | 13.6       | 14.9       | 14.6       | 15.5       | 14.5       | 14.8       | 14.4       | 16.0       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | 0.0195                | 0.0162       | 0.0204     | 0.0168     | 0.0159     | 0.0126     | 0.0217     | 0.0045     | 0.0155     | 0.0133     | 0.0199     | 0.0135     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00742               | 0.00752      | 0.00738    | 0.00805    | 0.00742    | 0.00758    | 0.00760    | 0.00743    | 0.00779    | 0.00790    | 0.00735    | 0.00759    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.012                 | 0.014        | 0.010      | 0.012      | 0.010      | 0.013      | 0.011      | 0.013      | 0.011      | 0.013      | 0.011      | 0.017      |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.0000050            | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 14.0                  | 14.7         | 13.8       | 14.3       | 13.4       | 14.3       | 14.0       | 14.5       | 13.9       | 14.2       | 13.6       | 14.3       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00015               | <0.00010     | <0.00010   | <0.00010   | <0.00010   | 0.00011    | 0.00010    | <0.00010   | 0.00011    | <0.00010   | 0.00015    | 0.00011    |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00090               | 0.00093      | 0.00089    | 0.00095    | 0.00090    | 0.00093    | 0.00090    | 0.00085    | 0.00092    | 0.00095    | 0.00099    | 0.00089    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | 0.028                 | 0.024        | 0.040      | 0.022      | 0.023      | 0.018      | 0.030      | <0.010     | 0.023      | 0.018      | 0.027      | 0.020      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0014                | 0.0014       | 0.0013     | 0.0014     | 0.0013     | 0.0014     | 0.0014     | 0.0018     | 0.0014     | 0.0014     | 0.0013     | 0.0015     |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 8.70                  | 9.00         | 9.23       | 9.57       | 9.10       | 9.94       | 8.65       | 9.73       | 9.41       | 10.1       | 8.69       | 8.51       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.00334               | 0.00295      | 0.00404    | 0.00258    | 0.00320    | 0.00251    | 0.00351    | 0.00053    | 0.00273    | 0.00247    | 0.00347    | 0.00262    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000962              | 0.00104      | 0.000898   | 0.000947   | 0.000893   | 0.000981   | 0.000990   | 0.00101    | 0.000966   | 0.000972   | 0.00101    | 0.00103    |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00072               | 0.00069      | 0.00071    | 0.00075    | 0.00073    | 0.00073    | 0.00075    | 0.00069    | 0.00071    | 0.00072    | 0.00076    | 0.00073    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.30                  | 1.35         | 1.29       | 1.35       | 1.30       | 1.37       | 1.31       | 1.37       | 1.32       | 1.38       | 1.30       | 1.28       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | 0.000064              | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000060   |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.66                  | 0.68         | 0.67       | 0.60       | 0.62       | 0.59       | 0.63       | 0.63       | 0.60       | 0.59       | 0.66       | 0.61       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.72                  | 1.82         | 1.77       | 1.91       | 1.78       | 1.91       | 1.77       | 1.95       | 1.85       | 1.93       | 1.74       | 1.78       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00977               | 0.0103       | 0.0102     | 0.0108     | 0.00986    | 0.0107     | 0.0102     | 0.0107     | 0.0104     | 0.0110     | 0.0102     | 0.0102     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.00108               | 0.00073      | 0.00119    | 0.00070    | 0.00088    | 0.00057    | 0.00117    | <0.00030   | 0.00075    | 0.00055    | 0.00099    | 0.00058    |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00131               | 0.00146      | 0.00120    | 0.00136    | 0.00128    | 0.00136    | 0.00134    | 0.00143    | 0.00132    | 0.00136    | 0.00132    | 0.00142    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | <0.00050              | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030      | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**

 Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.



Table C.42: Water Chemistry at Sheardown Lake NW (DLO-01) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Fall Sampling Event |                      |                 |                  |                 |                  |                 |                  |                 |                  |                 |                  |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|---------------------|----------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
|                        |                                    |         |                                            |                             | DD-HAB9-STN1 bottom | DD-HAB9-STN1 surface | DL0-01-5 bottom | DL0-01-5 surface | DL0-01-1 bottom | DL0-01-1 surface | DL0-01-4 bottom | DL0-01-4 surface | DL0-01-2 bottom | DL0-01-2 surface | DL0-01-7 bottom | DL0-01-7 surface |
|                        |                                    |         |                                            |                             | 26-Aug-20           | 26-Aug-20            | 27-Aug-20       | 27-Aug-20        | 27-Aug-20       | 27-Aug-20        | 27-Aug-20       | 27-Aug-20        | 27-Aug-20       | 27-Aug-20        | 26-Aug-20       | 26-Aug-20        |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 165                 | 165                  | 166             | 168              | 167             | 167              | 168             | 168              | 166             | 166              | 164             | 164              |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.05                | 8.03                 | 7.98            | 7.99             | 8.07            | 7.99             | 8.05            | 8.03             | 7.97            | 8.03             | 8.00            | 8.03             |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 81.2                | 79.1                 | 78.5            | 79.3             | 79.4            | 82.2             | 80.7            | 81.2             | 80.3            | 79.7             | 79.8            | 80.1             |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                | <2.0                 | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             | <2.0            | <2.0             |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 84                  | 92                   | 87              | 110              | 88              | 83               | 76              | 80               | 98              | 101              | 78              | 127              |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.58                | 0.57                 | 0.48            | 0.51             | 0.61            | 0.52             | 0.49            | 0.51             | 0.60            | 0.62             | 0.58            | 0.56             |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 62                  | 62                   | 68              | 63               | 64              | 63               | 62              | 63               | 190             | 63               | 61              | 61               |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010              | <0.010               | 0.028           | <0.010           | <0.010          | 0.017            | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.207               | 0.202                | 0.19            | 0.201            | 0.244           | 0.194            | 0.201           | 0.255            | 0.228           | 0.195            | 0.208           | 0.212            |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050             | <0.0050              | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          | <0.0050         | <0.0050          |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15               | <0.15                | 0.20            | 0.16             | <0.15           | 0.15             | <0.15           | <0.15            | <0.15           | <0.15            | <0.15           | <0.15            |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.03                | 2.08                 | 2.06            | 2.09             | 1.95            | 1.95             | 2.15            | 2.05             | 1.98            | 2.13             | 2.04            | 1.93             |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.49                | 2.46                 | 2.76            | 2.54             | 2.45            | 2.61             | 2.64            | 2.40             | 2.54            | 2.60             | 2.33            | 2.42             |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0083              | 0.0062               | 0.0102          | 0.004            | 0.0061          | 0.0094           | 0.0067          | 0.0079           | 0.0085          | 0.0059           | 0.0059          | 0.0071           |
|                        | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | <0.0010             | <0.0010              | 0.0056          | <0.0010          | <0.0010         | 0.0031           | <0.0010         | <0.0010          | 0.0012          | <0.0010          | <0.0010         | <0.0010          |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10               | <0.10                | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            | <0.10           | <0.10            |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 4.56                | 4.52                 | 4.44            | 4.45             | 4.49            | 4.45             | 4.48            | 4.5              | 4.45            | 4.44             | 4.52            | 4.56             |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>b</sup>                           | 218                         | 15.3                | 15.3                 | 15.1            | 15.1             | 15.2            | 15.1             | 15.3            | 15.3             | 15.1            | 15.1             | 15.2            | 15.2             |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | 0.0087              | 0.003                | 0.0097          | 0.0087           | 0.0079          | 0.0083           | 0.0082          | 0.0092           | 0.009           | 0.0084           | 0.0102          | 0.0376           |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010            | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010            | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | 0.00011         | <0.00010         | <0.00010        | <0.00010         |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00813             | 0.00817              | 0.00817         | 0.0081           | 0.00814         | 0.00793          | 0.00838         | 0.00865          | 0.00785         | 0.00813          | 0.0082          | 0.00837          |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00050            | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050            | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.014               | 0.014                | 0.013           | 0.013            | 0.013           | 0.013            | 0.015           | 0.015            | 0.014           | 0.013            | 0.013           | 0.012            |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.000010           | <0.000010            | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 15.8                | 15.7                 | 15.6            | 15.4             | 15.4            | 15.2             | 15.3            | 15.8             | 15.4            | 15.6             | 15.3            | 15.3             |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050            | <0.00050             | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         | <0.00050        | <0.00050         |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | <0.00010            | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00086             | 0.00081              | 0.00083         | 0.00085          | 0.00084         | 0.00083          | 0.00084         | 0.00084          | 0.00088         | 0.00086          | 0.00082         | 0.00086          |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | <0.030              | <0.030               | <0.030          | <0.030           | <0.030          | <0.030           | 0.041           | <0.030           | <0.030          | <0.030           | <0.030          | 0.051            |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050           | <0.000050            | <0.000050       | <0.000050        | <0.000050       | <0.000050        | <0.000050       | <0.000050        | <0.000050       | <0.000050        | <0.000050       | <0.000050        |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0016              | 0.0017               | 0.0014          | 0.0014           | 0.0014          | 0.0014           | 0.0016          | 0.0016           | 0.0016          | 0.0016           | 0.0016          | 0.0014           |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 10.1                | 10.0                 | 10.1            | 9.96             | 9.92            | 10.1             | 10.2            | 10.3             | 10.1            | 10.2             | 10.1            | 10.0             |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>b</sup>                         | -                           | 0.00136             | 0.000124             | 0.00134         | 0.00134          | 0.00141         | 0.00129          | 0.00138         | 0.00137          | 0.00127         | 0.00131          | 0.00141         | 0.00228          |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050          | <0.0000050           | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       | <0.0000050      | <0.0000050       |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000999            | 0.00103              | 0.00102         | 0.00102          | 0.00101         | 0.001            | 0.000998        | 0.00101          | 0.00103         | 0.000986         | 0.00101         | 0.000973         |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00068             | 0.00065              | 0.0007          | 0.00072          | 0.00067         | 0.00069          | 0.00068         | 0.0007           | 0.0007          | 0.00068          | 0.00068         | 0.00071          |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.39                | 1.36                 | 1.36            | 1.37             | 1.37            | 1.36             | 1.41            | 1.40             | 1.38            | 1.36             | 1.36            | 1.39             |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010             | <0.0010              | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.56                | 0.55                 | 0.54            | 0.56             | 0.54            | 0.55             | 0.57            | 0.57             | 0.55            | 0.56             | 0.56            | 0.59             |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010           | <0.000010            | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        | <0.000010       | <0.000010        |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.96                | 1.94                 | 1.95            | 1.96             | 1.94            | 1.96             | 1.98            | 1.95             | 1.98            | 1.98             | 1.93            | 1.97             |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0109              | 0.0109               | 0.0109          | 0.0108           | 0.0108          | 0.0108           | 0.011           | 0.011            | 0.0108          | 0.0107           | 0.0108          | 0.0107           |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010            | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010            | <0.00010             | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         | <0.00010        | <0.00010         |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010              | <0.010               | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           | <0.010          | <0.010           |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00155             | 0.00156              | 0.00153         | 0.00152          | 0.00155         | 0.00153          | 0.00153         | 0.00151          | 0.00148         | 0.00151          | 0.00152         | 0.00155          |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | <0.0010             | <0.0010              | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          | <0.0010         | <0.0010          |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030             | <0.0030              | <0.0030         | <0.0030          | <0.0030         | <0.0030          | <0.0030         | <0.0030          | <0.0030         | <0.0030          | <0.0030         | <0.0030          |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD**

 Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

**Table C.43: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between the Sheardown Lake Basins and Reference Lake 3 in 2020, and at the Sheardown Lake Basins Between 2020 and the Baseline Period**

| Variable                           | Sheardown Lake NW        |      |                  |        |      | Sheardown Lake SE        |      |                  |        |      |
|------------------------------------|--------------------------|------|------------------|--------|------|--------------------------|------|------------------|--------|------|
|                                    | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      |
|                                    | Summer                   | Fall | Winter           | Summer | Fall | Summer                   | Fall | Winter           | Summer | Fall |
| Conductivity (lab)                 | 2.1                      | 2.1  | 1.3              | 1.4    | 1.4  | 1.6                      | 1.8  | 1.2              | 1.3    | 1.3  |
| Hardness (as CaCO <sub>3</sub> )   | 2.2                      | 2.1  | 1.5              | 1.3    | 1.3  | 1.7                      | 1.8  | 1.3              | 1.3    | 1.3  |
| Total Suspended Solids (TSS)       | 1.3                      | 1.0  | 1.0              | 0.6    | 0.8  | 1.0                      | 1.1  | 0.9              | 0.8    | 0.9  |
| Total Dissolved Solids (TDS)       | 2.3                      | 1.8  | 1.3              | 1.2    | 1.2  | 1.7                      | 1.5  | 1.3              | 1.1    | 1.1  |
| Turbidity                          | 5.7                      | 3.8  | 0.5              | 1.1    | 1.0  | 6.3                      | 16   | 0.5              | 0.6    | 1.3  |
| Alkalinity (as CaCO <sub>3</sub> ) | 1.3                      | 2.1  | 1.1              | 1.0    | 1.3  | 1.1                      | 1.6  | 1.0              | 1.0    | 1.1  |
| Total Ammonia                      | 0.5                      | 0.9  | 0.2              | 0.1    | 0.3  | 0.7                      | 0.9  | 0.2              | 0.3    | 0.4  |
| Nitrate                            | 11                       | 11   | 2.1              | 2.2    | 2.1  | 4.8                      | 4.5  | 2.3              | 1.0    | 0.9  |
| Nitrite                            | 0.3                      | 1.0  | 1.3              | 0.0    | 1.1  | 0.3                      | 1.0  | 1.4              | 0.1    | 1.1  |
| Total Kjeldahl Nitrogen (TKN)      | 0.8                      | 1.0  | 0.8              | 0.8    | 1.0  | 0.8                      | 1.0  | 0.7              | 0.9    | 0.7  |
| Dissolved Organic Carbon           | 0.5                      | 0.6  | 1.5              | 1.0    | 1.2  | 0.6                      | 0.6  | 1.4              | 1.3    | 1.4  |
| Total Organic Carbon               | 0.4                      | 0.7  | 2.1              | 1.0    | 1.4  | 0.4                      | 0.6  | 1.4              | 1.1    | 1.5  |
| Total Phosphorus                   | 1.1                      | 2.3  | 1.9              | 0.7    | 1.4  | 1.6                      | 2.9  | 0.8              | 0.9    | 1.7  |
| Phenols                            | 1.8                      | 1.5  | 1.7              | 1.8    | 1.6  | 2.6                      | 1.0  | 1.0              | 2.6    | 1.0  |
| Bromide (Br)                       | 0.5                      | 1.0  | 0.6              | 0.2    | 0.4  | 0.5                      | 1.0  | 0.7              | 0.2    | 0.4  |
| Chloride (Cl)                      | 3.1                      | 3.3  | 1.6              | 1.7    | 1.6  | 2.4                      | 2.8  | 1.6              | 1.4    | 1.3  |
| Sulphate (SO <sub>4</sub> )        | 4.1                      | 4.2  | 5.2              | 5.4    | 5.0  | 2.6                      | 2.6  | 4.3              | 4.2    | 3.9  |
| Aluminum (Al)                      | 5.2                      | 3.4  | 1.6              | 1.1    | 0.5  | 8.6                      | 20   | 1.0              | 0.3    | 0.9  |
| Antimony (Sb)                      | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Arsenic (As)                       | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Barium (Ba)                        | 1.2                      | 1.2  | 1.5              | 1.5    | 1.6  | 1.0                      | 1.1  | 1.6              | 1.2    | 1.3  |
| Beryllium (Be)                     | 0.2                      | 1.0  | 2.0              | 0.3    | 1.5  | 0.2                      | 1.0  | 1.5              | 0.2    | 1.3  |
| Bismuth (Bi)                       | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  |
| Boron (B)                          | 1.2                      | 1.4  | 1.1              | 1.2    | 1.4  | 1.0                      | 1.1  | 1.1              | 1.0    | 1.1  |
| Cadmium (Cd)                       | 0.5                      | 1.0  | 0.8              | 0.4    | 0.9  | 0.5                      | 1.0  | 0.8              | 0.4    | 0.8  |
| Calcium (Ca)                       | 2.0                      | 2.1  | 1.3              | 1.2    | 1.3  | 1.6                      | 1.8  | 1.2              | 1.2    | 1.2  |
| Chromium (Cr)                      | 0.2                      | 1.0  | -                | 0.9    | -    | 0.3                      | 1.0  | -                | 1.1    | -    |
| Cobalt (Co)                        | 1.0                      | 1.0  | 1.0              | 1.0    | 0.9  | 1.0                      | 1.0  | 1.0              | 0.9    | 0.9  |
| Copper (Cu)                        | 1.3                      | 1.1  | 1.0              | 0.9    | 0.6  | 1.1                      | 1.2  | 1.0              | 0.6    | 0.9  |
| Iron (Fe)                          | 0.8                      | 1.1  | 1.2              | 0.8    | 0.9  | 1.1                      | 2.1  | 0.6              | 0.3    | 0.8  |
| Lead (Pb)                          | 1.0                      | 1.0  | 1.0              | 0.9    | 0.1  | 1.1                      | 1.2  | 0.5              | 0.5    | 0.7  |
| Lithium (Li)                       | 1.4                      | 1.5  | 0.6              | 0.4    | 0.0  | 1.1                      | 1.3  | 0.4              | 0.3    | 0.3  |
| Magnesium (Mg)                     | 2.2                      | 2.2  | 1.4              | 1.3    | 1.4  | 1.6                      | 1.8  | 1.4              | 1.3    | 1.3  |
| Manganese (Mn)                     | 3.5                      | 1.9  | 1.2              | 1.6    | 0.6  | 6.6                      | 5.3  | 0.2              | 0.9    | 1.1  |
| Mercury (Hg)                       | 1.0                      | 1.0  | 0.5              | 0.4    | 0.1  | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  |
| Molybdenum (Mo)                    | 7.4                      | 6.6  | 1.5              | 1.5    | 1.5  | 4.8                      | 4.2  | 1.6              | 1.8    | 1.5  |
| Nickel (Ni)                        | 1.4                      | 1.4  | 1.0              | 1.1    | 1.0  | 1.2                      | 1.2  | 1.1              | 0.9    | 1.0  |
| Potassium (K)                      | 1.5                      | 1.5  | 1.6              | 1.7    | 1.6  | 1.2                      | 1.3  | 1.6              | 1.6    | 1.5  |
| Selenium (Se)                      | 0.1                      | 1.0  | -                | 0.6    | -    | 0.1                      | 1.0  | -                | -      | -    |
| Silicon (Si)                       | 1.3                      | 1.1  | 0.8              | 1.0    | 0.9  | 1.1                      | 1.0  | 0.8              | 0.8    | 0.7  |
| Silver (Ag)                        | 1.0                      | 1.0  | 2.5              | 1.0    | 1.3  | 1.0                      | 1.0  | 1.6              | 1.4    | 1.4  |
| Sodium (Na)                        | 2.1                      | 2.0  | 1.5              | 1.7    | 1.7  | 1.5                      | 1.8  | 1.9              | 2.1    | 1.9  |
| Strontium (Sr)                     | 1.2                      | 1.3  | 1.4              | 1.4    | 1.4  | 1.0                      | 1.2  | 1.3              | 1.1    | 1.1  |
| Thallium (Tl)                      | 0.1                      | 1.0  | 2.3              | 0.2    | 0.4  | 0.1                      | 1.0  | 1.6              | 0.1    | 1.3  |
| Tin (Sn)                           | 1.0                      | 1.0  | 0.2              | 0.2    | 0.2  | 1.0                      | 1.0  | 0.1              | 0.1    | 0.1  |
| Titanium (Ti)                      | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  | 0.1                      | 1.0  | 1.0              | 0.1    | 0.9  |
| Uranium (U)                        | 4.3                      | 4.6  | 1.5              | 1.8    | 1.8  | 2.8                      | 3.6  | 1.6              | 1.6    | 1.6  |
| Vanadium (V)                       | 0.5                      | 1.0  | 1.0              | 0.5    | 1.0  | 0.5                      | 1.0  | 1.0              | 0.5    | 1.0  |
| Zinc (Zn)                          | 1.0                      | 1.0  | 1.4              | 1.5    | 1.2  | 1.0                      | 1.0  | 1.2              | 1.8    | 1.9  |

- Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
- Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
- Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).
- Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.

Table C.44: Dissolved Metal Concentrations at Sheardown Lake NW Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Winter Sampling Event |              |            |            |            |            |            |            |            |            |            |            | Summer Sampling Event |              |            |            |            |            |
|------------------|-----------------|-------|-----------------------|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|--------------|------------|------------|------------|------------|
|                  |                 |       | DD-HAB9-STN1          | DD-HAB9-STN1 | DL0-01-5   | DL0-01-5   | DL0-01-1   | DL0-01-1   | DL0-01-4   | DL0-01-4   | DL0-01-2   | DL0-01-2   | DL0-01-7   | DL0-01-7   | DD-HAB9-STN1          | DD-HAB9-STN1 | DL0-01-5   | DL0-01-5   | DL0-01-1   | DL0-01-1   |
|                  |                 |       | bottom                | surface      | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom                | surface      | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 17-Apr-20             | 17-Apr-20    | 17-Apr-20  | 17-Apr-20  | 17-Apr-20  | 17-Apr-20  | 17-Apr-20  | 16-Apr-20  | 16-Apr-20  | 17-Apr-20  | 17-Apr-20  | 15-Apr-20  | 15-Apr-20             | 28-Jul-20    | 28-Jul-20  | 29-Jul-20  | 29-Jul-20  | 29-Jul-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | <0.0030               | <0.0030      | <0.0030    | 0.0032     | 0.0406     | <0.0030    | <0.0030    | 0.0052     | 0.0037     | <0.0030    | 0.0065     | <0.0030    | 0.0025                | 0.0035       | 0.0031     | 0.0036     | 0.0030     | 0.0226     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00880               | 0.0102       | 0.00861    | 0.00899    | 0.00877    | 0.00891    | 0.00936    | 0.00960    | 0.00847    | 0.00873    | 0.00951    | 0.0102     | 0.00663               | 0.00693      | 0.00755    | 0.00752    | 0.00736    | 0.00775    |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Boron (B)       | mg/L  | 0.012                 | 0.012        | 0.011      | 0.012      | 0.011      | 0.012      | 0.012      | 0.012      | 0.010      | 0.011      | 0.012      | 0.012      | 0.011                 | 0.012        | 0.010      | 0.012      | 0.011      | 0.012      |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.0000050            | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Calcium (Ca)    | mg/L  | 19.4                  | 20.6         | 19.0       | 19.8       | 18.1       | 19.4       | 20.6       | 20.3       | 18.0       | 18.7       | 18.1       | 19.3       | 13.8                  | 14.2         | 14.7       | 15.0       | 14.6       | 14.3       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00010     | 0.00012    | <0.00010   | <0.00010   | <0.00010   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00095               | 0.00101      | 0.00095    | 0.00096    | 0.00096    | 0.00096    | 0.00093    | 0.00095    | 0.00089    | 0.00093    | 0.00110    | 0.00101    | 0.00070               | 0.00079      | 0.00081    | 0.00085    | 0.00080    | 0.00081    |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030       | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.010                | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0017                | 0.0017       | 0.0016     | 0.0016     | 0.0016     | 0.0017     | 0.0016     | 0.0017     | 0.0014     | 0.0015     | 0.0014     | 0.0017     | 0.0013                | 0.0013       | 0.0013     | 0.0014     | 0.0014     | 0.0015     |
|                  | Magnesium (Mg)  | mg/L  | 11.6                  | 12.9         | 10.9       | 11.7       | 11.2       | 11.9       | 12.2       | 12.4       | 11.2       | 11.7       | 12.5       | 13.2       | 9.09                  | 9.10         | 9.21       | 9.69       | 9.19       | 9.65       |
|                  | Manganese (Mn)  | mg/L  | 0.000171              | 0.000173     | 0.000174   | 0.000137   | 0.000296   | 0.000123   | 0.000133   | 0.000208   | 0.000200   | 0.000153   | 0.000215   | 0.000148   | <0.00010              | 0.00038      | 0.00015    | 0.00041    | <0.00010   | 0.00043    |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.00119               | 0.00124      | 0.00108    | 0.00128    | 0.00109    | 0.00124    | 0.00133    | 0.00129    | 0.00113    | 0.00120    | 0.00115    | 0.00127    | 0.000906              | 0.000980     | 0.000920   | 0.00101    | 0.000927   | 0.000940   |
|                  | Nickel (Ni)     | mg/L  | 0.00076               | 0.00084      | 0.00072    | 0.00079    | 0.00075    | 0.00080    | 0.00077    | 0.00081    | 0.00081    | 0.00078    | 0.00087    | 0.00087    | 0.00060               | 0.00064      | 0.00066    | 0.00069    | 0.00067    | 0.00072    |
|                  | Potassium (K)   | mg/L  | 1.62                  | 1.73         | 1.51       | 1.65       | 1.54       | 1.67       | 1.69       | 1.74       | 1.54       | 1.60       | 1.65       | 1.73       | 1.30                  | 1.27         | 1.33       | 1.36       | 1.33       | 1.42       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.000050             | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Silicon (Si)    | mg/L  | 0.55                  | 0.56         | 0.79       | 0.55       | 0.74       | 0.55       | 0.58       | 0.59       | 0.66       | 0.53       | 0.61       | 0.62       | 0.561                 | 0.527        | 0.634      | 0.559      | 0.604      | 0.542      |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 2.21                  | 2.43         | 2.11       | 2.24       | 2.15       | 2.31       | 2.32       | 2.41       | 2.13       | 2.21       | 2.35       | 2.44       | 1.77                  | 1.81         | 1.82       | 1.93       | 1.84       | 2.10       |
|                  | Strontium (Sr)  | mg/L  | 0.0127                | 0.0136       | 0.0122     | 0.0135     | 0.0123     | 0.0136     | 0.0143     | 0.0136     | 0.0121     | 0.0130     | 0.0133     | 0.0146     | 0.00945               | 0.0101       | 0.0103     | 0.0108     | 0.0101     | 0.0108     |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.000010             | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.00030              | <0.00030     | <0.00030   | <0.00030   | <0.00030   | <0.00030   |
|                  | Uranium (U)     | mg/L  | 0.00142               | 0.00151      | 0.00128    | 0.00146    | 0.00136    | 0.00148    | 0.00159    | 0.00159    | 0.00136    | 0.00147    | 0.00148    | 0.00156    | 0.00127               | 0.00142      | 0.00121    | 0.00137    | 0.00127    | 0.00142    |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.00050              | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030      | <0.0030    | <0.0030    | 0.0116     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0050     | <0.0030               | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    |

Table C.44: Dissolved Metal Concentrations at Sheardown Lake NW Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Summer Sampling Event |            |            |            |            |            | Fall Sampling Event |              |            |            |            |            |            |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|------------|---------------------|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                  |                 |       | DL0-01-04             | DL0-01-04  | DL0-01-2   | DL0-01-2   | DL0-01-7   | DL0-01-7   | DD-HAB9-STN1        | DD-HAB9-STN1 | DL0-01-1   | DL0-01-1   | DL0-01-5   | DL0-01-5   | DL0-01-4   | DL0-01-4   | DL0-01-2   | DL0-01-2   | DL0-01-7   | DL0-01-7   |
|                  |                 |       | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom              | surface      | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 28-Jul-20             | 28-Jul-20  | 29-Jul-20  | 29-Jul-20  | 28-Jul-20  | 28-Jul-20  | 26-Aug-20           | 26-Aug-20    | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 26-Aug-20  | 26-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0028                | 0.0149     | 0.0241     | 0.0038     | 0.0038     | 0.0039     | <0.0030             | 0.0088       | <0.0030    | <0.0030    | 0.0032     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00760               | 0.00792    | 0.00769    | 0.00788    | 0.00745    | 0.00786    | 0.0082              | 0.00799      | 0.00786    | 0.00774    | 0.00786    | 0.00808    | 0.00812    | 0.00797    | 0.00786    | 0.00795    | 0.00791    | 0.00802    |
|                  | Beryllium (Be)  | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00050            | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.00050            | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L  | 0.012                 | 0.013      | 0.011      | 0.013      | 0.011      | 0.019      | 0.014               | 0.014        | 0.013      | 0.013      | 0.014      | 0.014      | 0.015      | 0.015      | 0.014      | 0.013      | 0.013      | 0.013      |
|                  | Cadmium (Cd)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.000010           | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L  | 15.2                  | 14.9       | 14.7       | 15.0       | 13.6       | 15.2       | 15.8                | 15.3         | 15.2       | 15.4       | 15.1       | 15.9       | 15.4       | 15.9       | 15.5       | 15.3       | 15.5       | 15.5       |
|                  | Chromium (Cr)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00050            | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00078               | 0.00087    | 0.00080    | 0.00086    | 0.00081    | 0.00085    | 0.00082             | 0.00082      | 0.00079    | 0.00079    | 0.00082    | 0.0008     | 0.00079    | 0.0008     | 0.00081    | 0.00082    | 0.0008     | 0.00082    |
|                  | Iron (Fe)       | mg/L  | <0.010                | 0.019      | <0.010     | <0.010     | <0.010     | <0.010     | <0.030              | <0.030       | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050           | <0.000050    | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0015                | 0.0013     | 0.0014     | 0.0015     | 0.0012     | 0.0015     | 0.0017              | 0.0016       | 0.0014     | 0.0015     | 0.0017     | 0.0018     | 0.0017     | 0.0018     | 0.0015     | 0.0016     | 0.0015     | 0.0016     |
|                  | Magnesium (Mg)  | mg/L  | 9.24                  | 10.1       | 9.58       | 9.67       | 9.70       | 10.3       | 10.1                | 9.92         | 9.85       | 9.95       | 10.1       | 10.3       | 10.3       | 10.1       | 10.1       | 10.1       | 9.98       | 10         |
|                  | Manganese (Mn)  | mg/L  | 0.00018               | 0.00267    | 0.00024    | 0.00043    | <0.00010   | 0.00059    | 0.000158            | 0.00136      | 0.000092   | 0.000095   | 0.000108   | 0.000113   | 0.000138   | 0.000114   | 0.000104   | 0.000128   | 0.000091   | 0.0001     |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000977              | 0.000989   | 0.000972   | 0.000988   | 0.000856   | 0.000946   | 0.00106             | 0.001        | 0.00103    | 0.00099    | 0.00101    | 0.00102    | 0.00101    | 0.00101    | 0.00101    | 0.00101    | 0.00102    | 0.00105    |
|                  | Nickel (Ni)     | mg/L  | 0.00064               | 0.00067    | 0.00068    | 0.00068    | 0.00062    | 0.00066    | 0.00068             | 0.0007       | 0.00064    | 0.00065    | 0.00075    | 0.00066    | 0.00066    | 0.00069    | 0.00066    | 0.00069    | 0.00067    | 0.00063    |
|                  | Potassium (K)   | mg/L  | 1.41                  | 1.32       | 1.38       | 1.39       | 1.31       | 1.35       | 1.38                | 1.36         | 1.33       | 1.35       | 1.37       | 1.39       | 1.4        | 1.39       | 1.37       | 1.38       | 1.36       | 1.36       |
|                  | Selenium (Se)   | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.0010             | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 0.583                 | 0.572      | 0.570      | 0.561      | 0.532      | 0.560      | 0.57                | 0.55         | 0.53       | 0.55       | 0.55       | 0.58       | 0.55       | 0.55       | 0.55       | 0.57       | 0.54       | 0.55       |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010           | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 1.81                  | 1.96       | 2.03       | 1.92       | 1.86       | 1.95       | 1.96                | 1.95         | 1.93       | 1.94       | 1.97       | 2.02       | 2.05       | 1.95       | 2          | 2          | 1.91       | 1.92       |
|                  | Strontium (Sr)  | mg/L  | 0.0103                | 0.0104     | 0.0108     | 0.0110     | 0.00987    | 0.0109     | 0.011               | 0.0108       | 0.011      | 0.0105     | 0.0109     | 0.0108     | 0.0109     | 0.0109     | 0.0109     | 0.0108     | 0.0107     | 0.0109     |
|                  | Thallium (Tl)   | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.00010            | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.00030              | 0.00057    | <0.00030   | <0.00030   | <0.00030   | <0.00030   | <0.010              | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.00135               | 0.00139    | 0.00130    | 0.00134    | 0.00123    | 0.00136    | 0.00178             | 0.00157      | 0.00153    | 0.00152    | 0.00152    | 0.00154    | 0.00149    | 0.00152    | 0.00149    | 0.0015     | 0.00151    | 0.00152    |
|                  | Vanadium (V)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.0010             | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0010               | <0.0010    | 0.0012     | <0.0010    | <0.0010    | 0.0012     | <0.0030             | <0.0030      | <0.0030    | <0.0030    | <0.0030    | 0.0032     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

**Table C.45: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Sheardown Lake Northwest and Reference Lake 3 in 2020, and at Sheardown Lake Northwest Between 2020 and the Baseline Period**

| Dissolved Metal | Sheardown Lake NW        |      |                  |        |      |
|-----------------|--------------------------|------|------------------|--------|------|
|                 | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      |
|                 | Summer                   | Fall | Winter           | Summer | Fall |
| Aluminum (Al)   | 0.6                      | 0.8  | 0.0              | 1.6    | 1.2  |
| Antimony (Sb)   | 1.0                      | 1.0  | 0.0              | 0.0    | 1.0  |
| Arsenic (As)    | 1.0                      | 1.0  | 1.0              | 0.8    | 1.0  |
| Barium (Ba)     | 1.2                      | 1.2  | 0.0              | 1.4    | 1.4  |
| Beryllium (Be)  | 0.2                      | 1.0  | 1.2              | 0.2    | 2.1  |
| Bismuth (Bi)    | 0.1                      | 1.0  | 1.0              | 0.0    | 1.0  |
| Boron (B)       | 1.2                      | 1.4  | 1.2              | 1.3    | 1.4  |
| Cadmium (Cd)    | 0.5                      | 1.0  | 0.4              | 0.0    | 0.8  |
| Calcium (Ca)    | 2.1                      | 2.1  | 1.5              | 1.3    | 1.3  |
| Chromium (Cr)   | 0.2                      | 1.0  | -                | 0.9    | -    |
| Cobalt (Co)     | 1.0                      | 1.0  | 1.0              | 1.0    | 0.9  |
| Copper (Cu)     | 1.2                      | 1.1  | 0.8              | 0.5    | 1.0  |
| Iron (Fe)       | 0.4                      | 1.0  | 1.2              | 0.4    | 1.7  |
| Lead (Pb)       | 1.0                      | 1.0  | 0.6              | 1.0    | 1.0  |
| Lithium (Li)    | 1.4                      | 1.6  | 0.4              | 0.0    | 0.7  |
| Magnesium (Mg)  | 2.2                      | 2.1  | 1.5              | 1.4    | 1.4  |
| Manganese (Mn)  | 2.2                      | 1.6  | 0.3              | 0.0    | 0.3  |
| Mercury (Hg)    | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  |
| Molybdenum (Mo) | 7.3                      | 6.6  | 5.3              | 0.0    | 5.1  |
| Nickel (Ni)     | 1.3                      | 1.3  | 1.1              | 0.7    | 1.2  |
| Potassium (K)   | 1.6                      | 1.5  | 1.0              | 1.2    | 1.1  |
| Selenium (Se)   | 0.1                      | 1.0  | -                | 0.5    | -    |
| Silicon (Si)    | 1.2                      | 1.1  | 1.3              | 1.4    | 1.4  |
| Silver (Ag)     | 1.0                      | 1.0  | 1.2              | 1.8    | 2.7  |
| Sodium (Na)     | 2.1                      | 1.9  | 1.4              | 1.5    | 1.5  |
| Strontium (Sr)  | 1.3                      | 1.3  | 1.7              | 1.5    | 1.4  |
| Thallium (Tl)   | 0.1                      | 1.0  | 1.2              | 0.1    | 2.6  |
| Tin (Sn)        | 1.0                      | 1.0  | 0.1              | 0.2    | 0.1  |
| Titanium (Ti)   | 0.0                      | 1.0  | 1.0              | 0.0    | 1.0  |
| Uranium (U)     | 4.4                      | 4.7  | 3.0              | 2.9    | 3.1  |
| Vanadium (V)    | 0.5                      | 1.0  | 1.0              | 0.5    | 1.0  |
| Zinc (Zn)       | 0.3                      | 1.0  | 2.0              | 0.3    | 1.9  |

|  |                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).                 |
|  | Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).              |
|  | Denotes highly elevated concentration (mean concentration $\geq 10$ times higher than respective mean reference or baseline period value). |
|  | Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.      |

Table C.46: In Situ Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020

| Depth<br>(m)      | Temperature (°C) |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           | pH (pH units) |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|
|                   | DLO-02-6         | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                        | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6      | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                     | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  |
| Date<br>Collected | 15-Apr-20        | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | 15-Apr-20               | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | 15-Apr-20                       | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | 15-Apr-20     | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | 15-Apr-20                    | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 |
| 1.0               | 0.0              | -0.1      | 0.1       | 0.0       | 0.6       | 13.10                   | 13.71     | 14.17     | 14.03     | 13.39     | 89.6                            | 93.6      | 97.3      | 96.3      | 93.4      | 7.70          | 7.70      | 8.19      | 7.85      | 7.84      | 160.9                        | 170.6     | 200.7     | 176.4     | 199.8     |
| 2.0               | 0.0              | 0.0       | 0.3       | 0.1       | 0.2       | 12.82                   | 13.33     | 13.63     | 13.63     | 13.28     | 88.0                            | 91.2      | 94.0      | 93.9      | 91.6      | 7.56          | 7.64      | 7.94      | 7.76      | 7.69      | 157.6                        | 168.4     | 190.1     | 179.6     | 191.2     |
| 3.0               | 0.2              | 0.1       | 0.5       | 0.6       | 0.5       | 12.67                   | 12.54     | 13.39     | 13.24     | 12.92     | 87.4                            | 86.1      | 93.2      | 92.1      | 90.0      | 7.52          | 7.57      | 7.81      | 7.73      | 7.59      | 159.6                        | 173.7     | 187.7     | 177.5     | 187.9     |
| 4.0               | 0.5              | -         | 0.7       | 0.7       | 0.7       | 12.31                   | -         | 13.20     | 13.09     | 12.74     | 85.6                            | -         | 92.4      | 91.4      | 89.2      | 7.49          | -         | 7.71      | 7.70      | 7.54      | 169.2                        | -         | 186.3     | 179.5     | 186.3     |
| 5.0               | 0.8              | -         | 0.8       | 0.8       | 0.8       | 12.00                   | -         | 13.11     | 12.93     | 12.61     | 84.0                            | -         | 91.8      | 90.5      | 88.4      | 7.46          | -         | 7.69      | 7.69      | 7.49      | 182.7                        | -         | 186.0     | 181.2     | 185.5     |
| 6.0               | 1.0              | -         | 0.9       | 0.8       | 0.9       | 11.28                   | -         | 12.96     | 12.77     | 12.42     | 79.5                            | -         | 90.9      | 89.6      | 87.2      | 7.40          | -         | 7.65      | 7.66      | 7.45      | 194.6                        | -         | 185.7     | 183.4     | 184.2     |
| 7.0               | -                | -         | 0.9       | 0.9       | 0.9       | -                       | -         | 12.64     | 12.57     | 12.25     | -                               | -         | 88.8      | 88.3      | 86.1      | -             | -         | 7.62      | 7.64      | 7.41      | -                            | -         | 186.0     | 183.3     | 183.3     |
| 8.0               | -                | -         | 0.9       | 1.0       | 1.0       | -                       | -         | 12.06     | 12.23     | 11.98     | -                               | -         | 85.0      | 86.3      | 84.3      | -             | -         | 7.59      | 7.62      | 7.38      | -                            | -         | 187.7     | 182.0     | 182.4     |
| 9.0               | -                | -         | -         | 1.1       | 1.1       | -                       | -         | -         | 11.85     | 11.78     | -                               | -         | -         | 83.8      | 83.3      | -             | -         | -         | 7.59      | 7.37      | -                            | -         | -         | 181.0     | 181.8     |
| 10.0              | -                | -         | -         | 1.2       | 1.2       | -                       | -         | -         | 10.97     | 10.46     | -                               | -         | -         | 77.7      | 74.1      | -             | -         | -         | 7.50      | 7.35      | -                            | -         | -         | 180.1     | 180.7     |
| 11.0              | -                | -         | -         | 1.3       | 1.3       | -                       | -         | -         | 8.72      | 9.00      | -                               | -         | -         | 62.0      | 64.1      | -             | -         | -         | 7.48      | 7.28      | -                            | -         | -         | 180.4     | 182.6     |
| 12.0              | -                | -         | -         | 1.4       | 1.5       | -                       | -         | -         | 6.74      | 7.31      | -                               | -         | -         | 48.2      | 52.3      | -             | -         | -         | 7.40      | 7.23      | -                            | -         | -         | 181.2     | 183.6     |
| 13.0              | -                | -         | -         | -         | 1.7       | -                       | -         | -         | -         | 3.66      | -                               | -         | -         | -         | 26.2      | -             | -         | -         | -         | 7.13      | -                            | -         | -         | -         | 191.0     |

Notes: Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.8, 4.2, 8.7, 12.9, and 14.1 m, respectively, at the time of winter sampling. Ice thickness at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 1.40, 1.62, 1.86, 1.96, and 1.62 m, respectively, at the time of winter sampling.



Table C.47: In Situ Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020

| Depth<br>(m)      | Temperature (°C) |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           | pH (pH units) |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|
|                   | DLO-02-6         | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                        | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6      | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-6                     | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  |
| Date<br>Collected | 28-Jul-20        | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20               | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20                       | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20     | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20                    | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 |
| 1.0               | 15.6             | 15.6      | 16.0      | 16.0      | 15.8      | 10.56                   | 10.62     | 10.35     | 10.41     | 10.47     | 106.2                           | 106.6     | 105.0     | 105.5     | 105.7     | 8.32          | 8.33      | 8.29      | 8.32      | 8.27      | 132.4                        | 130.4     | 129.2     | 129.2     | 129.7     |
| 2.0               | 15.0             | 14.5      | 16.0      | 16.0      | 15.8      | 11.16                   | 11.31     | 10.35     | 10.43     | 10.49     | 110.3                           | 110.8     | 105.0     | 105.5     | 105.7     | 8.37          | 8.39      | 8.26      | 8.33      | 8.34      | 130.7                        | 128.6     | 129.5     | 129.4     | 129.9     |
| 3.0               | 14.1             | 13.6      | 15.6      | 15.5      | 14.0      | 11.70                   | 11.64     | 10.73     | 10.49     | 11.55     | 113.6                           | 112.0     | 107.2     | 105.1     | 112.0     | 8.47          | 8.38      | 8.26      | 8.30      | 8.39      | 128.6                        | 126.3     | 130.6     | 131.9     | 128.1     |
| 4.0               | 12.9             | -         | 12.7      | 12.7      | 12.3      | 12.03                   | -         | 11.64     | 11.82     | 11.83     | 113.8                           | -         | 109.3     | 111.1     | 110.5     | 8.48          | -         | 8.31      | 8.34      | 8.36      | 126.6                        | -         | 122.8     | 122.4     | 121.7     |
| 5.0               | 11.3             | -         | 11.5      | 11.7      | 11.4      | 12.15                   | -         | 11.75     | 11.74     | 11.77     | 110.8                           | -         | 108.0     | 108.2     | 107.8     | 8.36          | -         | 8.26      | 8.28      | 8.27      | 129.2                        | -         | 121.2     | 121.1     | 120.6     |
| 6.0               | 10.1             | -         | 10.7      | 11.0      | 10.8      | 11.78                   | -         | 11.52     | 11.58     | 11.53     | 104.8                           | -         | 103.8     | 105.1     | 104.2     | 8.17          | -         | 8.02      | 8.07      | 8.12      | 129.0                        | -         | 120.4     | 120.1     | 120.0     |
| 7.0               | -                | -         | 9.8       | 9.5       | 10.0      | -                       | -         | 11.28     | 11.12     | 11.26     | -                               | -         | 99.6      | 97.4      | 91.8      | -             | -         | 7.93      | 7.93      | 7.98      | -                            | -         | 119.6     | 118.4     | 119.2     |
| 8.0               | -                | -         | 8.4       | 8.3       | 8.2       | -                       | -         | 10.94     | 10.97     | 11.16     | -                               | -         | 93.4      | 93.3      | 95.0      | -             | -         | 7.81      | 7.80      | 7.86      | -                            | -         | 117.5     | 116.5     | 116.6     |
| 9.0               | -                | -         | -         | 7.4       | 7.4       | -                       | -         | -         | 10.89     | 10.98     | -                               | -         | -         | 90.6      | 91.3      | -             | -         | -         | 7.71      | 7.73      | -                            | -         | -         | 115.4     | 115.2     |
| 10.0              | -                | -         | -         | 6.1       | 6.8       | -                       | -         | -         | 10.70     | 10.86     | -                               | -         | -         | 86.5      | 89.1      | -             | -         | -         | 7.65      | 7.66      | -                            | -         | -         | 114.8     | 115.1     |
| 11.0              | -                | -         | -         | 5.9       | 6.3       | -                       | -         | -         | 10.31     | 10.68     | -                               | -         | -         | 83.1      | 86.4      | -             | -         | -         | 7.56      | 7.60      | -                            | -         | -         | 115.2     | 115.0     |
| 12.0              | -                | -         | -         | 5.7       | 6.0       | -                       | -         | -         | 10.03     | 10.33     | -                               | -         | -         | 80.1      | 82.9      | -             | -         | -         | 7.48      | 7.55      | -                            | -         | -         | 115.5     | 115.3     |
| 13.0              | -                | -         | -         | -         | 5.8       | -                       | -         | -         | -         | 10.06     | -                               | -         | -         | -         | 80.7      | -             | -         | -         | -         | 7.51      | -                            | -         | -         | -         | 115.6     |
| 14.0              | -                | -         | -         | -         | 5.6       | -                       | -         | -         | -         | 9.05      | -                               | -         | -         | -         | 71.9      | -             | -         | -         | -         | 7.48      | -                            | -         | -         | -         | 116.5     |

Note: Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.5, 3.8, 8.4, 12.6, and 13.3 m, respectively, at the time of summer sampling.

**Table C.48: *In Situ* Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)      | Temperature (°C) |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DLO-02-6         | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-3  | DLO-02-6                | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-3  | DLO-02-6                        | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-3  |
| Date<br>Collected | 26-Aug-20        | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 13-Aug-20 | 26-Aug-20               | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20                       | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 13-Aug-20 |
| surface           | -                | -         | -         | -         | -         | 10.5      | -                       | -         | -         | -         | -         | 10.67     | -                               | -         | -         | -         | -         | 98.2      |
| 1.0               | 8.6              | 8.6       | 8.7       | 8.7       | 8.7       | 10.6      | 11.42                   | 11.34     | 11.17     | 11.26     | 11.30     | 10.69     | 97.9                            | 97.3      | 96.0      | 96.8      | 97.0      | 98.2      |
| 2.0               | 8.6              | 8.6       | 8.7       | 8.7       | 8.7       | 10.5      | 11.41                   | 11.34     | 11.17     | 11.25     | 11.28     | 10.50     | 97.8                            | 97.2      | 96.0      | 96.7      | 97.0      | 96.8      |
| 3.0               | 8.6              | 8.6       | 8.7       | 8.7       | 8.7       | 10.5      | 11.41                   | 11.34     | 11.17     | 11.24     | 11.27     | 10.54     | 97.8                            | 97.1      | 96.0      | 96.6      | 96.9      | 96.9      |
| 4.0               | 8.6              | 8.6       | 8.7       | 8.7       | 8.7       | 10.5      | 11.39                   | 11.36     | 11.18     | 11.23     | 11.27     | 10.51     | 97.6                            | 97.2      | 96.1      | 96.6      | 96.9      | 96.5      |
| 5.0               | 8.6              | -         | 8.7       | 8.7       | 8.7       | 10.5      | 11.39                   | -         | 11.17     | 11.23     | 11.27     | 10.50     | 97.6                            | -         | 96.0      | 96.5      | 96.9      | 96.6      |
| 6.0               | -                | -         | 8.7       | 8.7       | 8.7       | 10.5      | -                       | -         | 11.16     | 11.23     | 11.26     | 10.51     | -                               | -         | 95.9      | 96.5      | 96.8      | 96.6      |
| 7.0               | -                | -         | 8.7       | 8.7       | 8.7       | 10.5      | -                       | -         | 11.16     | 11.22     | 11.26     | 10.30     | -                               | -         | 95.9      | 96.5      | 96.7      | 94.8      |
| 8.0               | -                | -         | -         | 8.7       | 8.7       | 10.5      | -                       | -         | -         | 11.22     | 11.25     | 10.62     | -                               | -         | -         | 96.4      | 96.7      | 97.5      |
| 9.0               | -                | -         | -         | 8.7       | 8.7       | 10.5      | -                       | -         | -         | 11.21     | 11.25     | 10.47     | -                               | -         | -         | 96.4      | 96.7      | 96.0      |
| 10.0              | -                | -         | -         | 8.7       | 8.7       | 10.1      | -                       | -         | -         | 11.21     | 11.24     | 10.23     | -                               | -         | -         | 96.3      | 96.6      | 92.9      |
| 11.0              | -                | -         | -         | 8.7       | 8.7       | 7.5       | -                       | -         | -         | 11.20     | 11.23     | 10.03     | -                               | -         | -         | 96.3      | 96.5      | 85.9      |
| 12.0              | -                | -         | -         | -         | 8.6       | 5.9       | -                       | -         | -         | -         | 11.22     | 8.53      | -                               | -         | -         | -         | 96.5      | 70.1      |
| 13.0              | -                | -         | -         | -         | -         | 5.9       | -                       | -         | -         | -         | -         | 8.07      | -                               | -         | -         | -         | -         | 66.1      |
| 14.0              | -                | -         | -         | -         | -         | -         | -                       | -         | -         | -         | -         | -         | -                               | -         | -         | -         | -         | -         |

Notes: 13-Aug-20 sampling was conducted by Minnow. Sheardown Lake SE water profile sampling on all other dates was conducted by Baffinland. Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.5, 3.7, 8.2, 12.6, and 14.1 m, respectively, at the time of fall sampling.



**Table C.48: *In Situ* Water Quality Profile Data Collected at Sheardown Lake SE Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)      | pH (pH units) |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |
|-------------------|---------------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|
|                   | DLO-02-6      | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-3  | DLO-02-6                     | DLO-02-7  | DLO-02-4  | DLO-02-8  | DLO-02-3  | DLO-02-3  |
| Date<br>Collected | 26-Aug-20     | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 13-Aug-20 | 26-Aug-20                    | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 13-Aug-20 |
| surface           | -             | -         | -         | -         | -         | 7.97      | -                            | -         | -         | -         | -         | 126.7     |
| 1.0               | 8.08          | 8.05      | 7.99      | 8.04      | 8.04      | 8.01      | 139.1                        | 138.3     | 136.9     | 137.3     | 137.5     | 126.7     |
| 2.0               | 8.08          | 8.06      | 7.99      | 8.03      | 8.04      | 8.02      | 139.2                        | 138.9     | 137.0     | 137.4     | 137.6     | 126.7     |
| 3.0               | 8.08          | 8.05      | 7.99      | 8.03      | 8.04      | 8.02      | 139.3                        | 139.0     | 137.0     | 137.4     | 137.6     | 126.7     |
| 4.0               | 8.08          | 8.07      | 7.99      | 8.03      | 8.04      | 8.03      | 139.4                        | 139.2     | 137.0     | 137.4     | 137.6     | 126.7     |
| 5.0               | 8.08          | -         | 8.00      | 8.03      | 8.04      | 8.04      | 139.5                        | -         | 137.1     | 137.5     | 137.7     | 126.7     |
| 6.0               | -             | -         | 8.00      | 8.03      | 8.04      | 8.03      | -                            | -         | 137.1     | 137.5     | 137.6     | 126.7     |
| 7.0               | -             | -         | 7.99      | 8.03      | 8.04      | 8.03      | -                            | -         | 137.1     | 137.5     | 137.7     | 126.7     |
| 8.0               | -             | -         | -         | 8.03      | 8.04      | 8.02      | -                            | -         | -         | 137.5     | 137.6     | 126.8     |
| 9.0               | -             | -         | -         | 8.03      | 8.04      | 8.00      | -                            | -         | -         | 137.5     | 137.6     | 126.8     |
| 10.0              | -             | -         | -         | 8.03      | 8.04      | 7.85      | -                            | -         | -         | 137.5     | 137.6     | 124.9     |
| 11.0              | -             | -         | -         | 8.02      | 8.03      | 7.50      | -                            | -         | -         | 137.5     | 137.6     | 117.0     |
| 12.0              | -             | -         | -         | -         | 8.03      | 7.10      | -                            | -         | -         | -         | 137.1     | 114.7     |
| 13.0              | -             | -         | -         | -         | -         | 6.83      | -                            | -         | -         | -         | -         | 115.2     |
| 14.0              | -             | -         | -         | -         | -         | -         | -                            | -         | -         | -         | -         | -         |

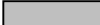
Notes: 13-Aug-20 sampling was conducted by Minnow. Sheardown Lake SE water profile sampling on all other dates was conducted by Baffinland. Total depth at stations DLO-02-6, DLO-02-7, DLO-02-4, DLO-02-8, and DLO-02-3 was 6.5, 3.7, 8.2, 12.6, and 14.1 m, respectively, at the time of fall sampling.

**Table C.49: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Sheardown Lake SE Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Categorization & Replicate ID |           | Date Sampled | Station Depth (m) | Secchi Depth (m) | Depth sampled | Temperature (°C) | Dissolved Oxygen |          | pH (units) | Specific Conductance (µS/cm) |
|-------------------------------|-----------|--------------|-------------------|------------------|---------------|------------------|------------------|----------|------------|------------------------------|
|                               |           |              |                   |                  |               |                  | (mg/L)           | (% sat.) |            |                              |
| Littoral (Shallow) Stations   | DLO-02-1  | 13-Aug-20    | 12.1              | 5.53             | surface       | 10.5             | 10.69            | 98.1     | 7.92       | 126.8                        |
|                               |           |              |                   |                  | bottom        | 10.4             | 10.45            | 96.0     | 7.90       | 128.1                        |
|                               | DLO-02-11 | 18-Aug-20    | 7.0               | 1.00             | surface       | 9.4              | 9.88             | 88.7     | 7.97       | 135.7                        |
|                               |           |              |                   |                  | bottom        | 9.4              | 9.73             | 87.2     | 7.98       | 135.7                        |
|                               | DLO-02-10 | 18-Aug-20    | 7.0               | 1.07             | surface       | 9.4              | 9.79             | 87.7     | 7.93       | 135.6                        |
|                               |           |              |                   |                  | bottom        | 9.4              | 9.80             | 87.6     | 7.95       | 135.8                        |
|                               | DLO-02-4  | 18-Aug-20    | 8.0               | 1.26             | surface       | 9.4              | 9.86             | 88.4     | 7.87       | 135.5                        |
|                               |           |              |                   |                  | bottom        | 9.4              | 9.17             | 82.2     | 7.75       | 134.7                        |
|                               | DLO-02-9  | 19-Aug-20    | 8.5               | 1.19             | surface       | 9.1              | 10.16            | 90.1     | 7.62       | 136.5                        |
|                               |           |              |                   |                  | bottom        | 9.1              | 10.03            | 89.3     | 7.55       | 136.5                        |
| Profundal (Deep) Stations     | DLO-02-12 | 18-Aug-20    | 11.0              | 1.66             | surface       | 9.3              | 11.06            | 96.5     | 8.11       | 132.8                        |
|                               |           |              |                   |                  | bottom        | 9.3              | 10.99            | 95.8     | 8.10       | 132.9                        |
|                               | DLO-02-8  | 19-Aug-20    | 13.0              | 1.10             | surface       | 9.1              | 10.60            | 94.4     | 7.51       | 136.4                        |
|                               |           |              |                   |                  | bottom        | 9.0              | 10.75            | 95.6     | 7.41       | 136.9                        |
|                               | DLO-02-13 | 19-Aug-20    | 11.0              | 1.28             | surface       | 9.1              | 10.66            | 94.6     | 7.55       | 136.1                        |
|                               |           |              |                   |                  | bottom        | 9.1              | 10.47            | 93.3     | 7.36       | 136.2                        |
|                               | DLO-02-2  | 19-Aug-20    | 15.0              | 1.40             | surface       | 9.1              | 10.65            | 94.6     | 7.61       | 136.4                        |
|                               |           |              |                   |                  | bottom        | 9.0              | 10.56            | 93.8     | 7.61       | 136.8                        |
|                               | DLO-02-3  | 13-Aug-20    | 13.2              | 5.36             | surface       | 10.5             | 10.56            | 97.9     | 7.89       | 126.6                        |
|                               |           |              |                   |                  | bottom        | 6.0              | 8.43             | 69.6     | 7.12       | 115.0                        |

**Table C.50: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake SE Littoral and Profundal Stations, Mary River Project CREMP, August 2020**

| Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |             |       |                    |                |         |         |
|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|-------------|-------|--------------------|----------------|---------|---------|
|                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Lake Zone          | Sample Size | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Secchi Depth (m)                | M-W                           | rank           | NO                                    | 0.310   | Littoral           | 5           | 2.01  | 1.97               | 0.88           | 1.00    | 5.53    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 2.16  | 1.80               | 0.80           | 1.10    | 5.36    |
| Temperature (°C)                | M-W                           | rank           | YES                                   | 0.025   | Littoral           | 5           | 9.54  | 0.50               | 0.22           | 9.10    | 10.40   |
|                                 |                               |                |                                       |         | Profundal          | 5           | 8.48  | 1.39               | 0.62           | 6.00    | 9.30    |
| Dissolved Oxygen (mg/L)         | M-W                           | rank           | NO                                    | 0.151   | Littoral           | 5           | 9.8   | 0.5                | 0.2            | 9.2     | 10.5    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 10.2  | 1.0                | 0.5            | 8.4     | 11.0    |
| Dissolved Oxygen (% saturation) | M-W                           | rank           | NO                                    | 0.548   | Littoral           | 5           | 88.5  | 5.0                | 2.2            | 82.2    | 96.0    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 89.6  | 11.2               | 5.0            | 69.6    | 95.8    |
| pH (units)                      | tequal                        | none           | NO                                    | 0.133   | Littoral           | 5           | 7.83  | 0.18               | 0.08           | 7.55    | 7.98    |
|                                 |                               |                |                                       |         | Profundal          | 5           | 7.52  | 0.37               | 0.16           | 7.12    | 8.10    |
| Specific Conductance (umho/cm)  | M-W                           | rank           | NO                                    | 0.690   | Littoral           | 5           | 134.2 | 3.4                | 1.5            | 128.1   | 136.5   |
|                                 |                               |                |                                       |         | Profundal          | 5           | 131.6 | 9.4                | 4.2            | 115.0   | 136.9   |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).

**Table C.51: Statistical Comparison of Bottom *In Situ* Water Quality Between Sheardown Lake SE Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Habitat Variable                | Statistical Test Results              |         |                      |                | Summary Statistics |                 |      |                    |                |         |         |
|-----------------------------|---------------------------------|---------------------------------------|---------|----------------------|----------------|--------------------|-----------------|------|--------------------|----------------|---------|---------|
|                             |                                 | Significant Difference Between Areas? | P-value | Statistical Analysis | Transformation | Study Lake         | Sample Size (n) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Station Depth (m)               | NO                                    | 0.246   | tequal               | none           | Reference          | 4               | 10.0 | 1.08               | 0.540          | 8.50    | 11.0    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 8.52 | 2.10               | 0.941          | 7.00    | 12.1    |
|                             | Secchi Depth (m)                | YES                                   | 0.008   | M-W                  | rank           | Reference          | 5               | 8.12 | 0.645              | 0.288          | 7.38    | 9.15    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 2.01 | 1.97               | 0.882          | 1.00    | 5.53    |
|                             | Temperature (°C)                | NO                                    | 0.420   | tequal               | none           | Reference          | 5               | 9.32 | 0.295              | 0.132          | 8.90    | 9.70    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 9.54 | 0.498              | 0.223          | 9.10    | 10.4    |
|                             | Dissolved Oxygen (mg/L)         | YES                                   | 0.001   | tequal               | none           | Reference          | 5               | 112  | 5.23               | 2.34           | 105     | 117     |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 88.5 | 4.98               | 2.23           | 82.2    | 96.0    |
|                             | Dissolved Oxygen (% saturation) | YES                                   | 0.001   | tequal               | none           | Reference          | 5               | 112  | 5.23               | 2.34           | 105     | 117     |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 88.5 | 4.98               | 2.23           | 82.2    | 96.0    |
|                             | pH (units)                      | YES                                   | 0.001   | tequal               | none           | Reference          | 5               | 7.19 | 0.228              | 0.102          | 6.94    | 7.56    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 7.83 | 0.178              | 0.0795         | 7.55    | 7.98    |
|                             | Specific Conductance (umho/cm)  | YES                                   | 0.001   | tequal               | none           | Reference          | 5               | 76.7 | 3.16               | 1.41           | 74.5    | 82.1    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 134  | 3.45               | 1.54           | 128     | 137     |
| Profundal (Deep) Stations   | Station Depth (m)               | YES                                   | 0.001   | tequal               | none           | Reference          | 5               | 20.6 | 1.56               | 0.696          | 19.0    | 23.0    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 12.6 | 1.69               | 0.755          | 11.0    | 15.0    |
|                             | Secchi Depth (m)                | YES                                   | 0.008   | M-W                  | rank           | Reference          | 5               | 8.39 | 0.962              | 0.430          | 7.18    | 9.84    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 2.16 | 1.80               | 0.805          | 1.10    | 5.36    |
|                             | Temperature (°C)                | YES                                   | 0.021   | M-W                  | rank           | Reference          | 5               | 5.82 | 0.192              | 0.0860         | 5.60    | 6.10    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 8.48 | 1.39               | 0.622          | 6.00    | 9.30    |
|                             | Dissolved Oxygen (mg/L)         | YES                                   | 0.015   | tequal               | none           | Reference          | 5               | 111  | 10.3               | 4.59           | 104     | 128     |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 89.6 | 11.2               | 5.03           | 69.6    | 95.8    |
|                             | Dissolved Oxygen (% saturation) | YES                                   | 0.015   | tequal               | none           | Reference          | 5               | 111  | 10.3               | 4.59           | 104     | 128     |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 89.6 | 11.2               | 5.03           | 69.6    | 95.8    |
|                             | pH (units)                      | YES                                   | 0.005   | tequal               | none           | Reference          | 5               | 6.70 | 0.295              | 0.132          | 6.27    | 6.95    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 7.52 | 0.368              | 0.165          | 7.12    | 8.10    |
|                             | Specific Conductance (umho/cm)  | YES                                   | 0.008   | M-W                  | rank           | Reference          | 5               | 75.5 | 1.64               | 0.734          | 74.0    | 78.1    |
|                             |                                 |                                       |         |                      |                | Mary Lake          | 5               | 132  | 9.40               | 4.20           | 115     | 137     |

Highlighted values indicate significant difference between study areas based on ANOVA p-value less than 0.10.

Notes: Analysis was completed on samples collected at the bottom of the water column. M-W = Mann-Whitney U-Test, tequal = T-test with equal variance, tunequal = T-test with unequal variance.

Table C.52: Water Chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Winter Sampling Event |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | DL0-02-6              | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   | DL0-02-8   | DL0-02-8   | DL0-02-3   | DL0-02-3   |
|                        |                                    |         |                                            |                             | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 15-Apr-20             | 15-Apr-20  | 15-Apr-20  | 15-Apr-20  | 14-Apr-20  | 14-Apr-20  | 14-Apr-20  | 14-Apr-20  | 15-Apr-20  | 15-Apr-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 204                   | 208        | 196        | 200        | 188        | 192        | 183        | 191        | 186        | 192        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.37                  | 7.42       | 7.47       | 7.45       | 7.48       | 7.50       | 7.37       | 7.51       | 7.28       | 7.50       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 108                   | 108        | 105        | 105        | 96.7       | 98.5       | 94.6       | 99.5       | 97.6       | 101        |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 155                   | 147        | 134        | 148        | 117        | 118        | 131        | 117        | 114        | 105        |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.18                  | 0.14       | 0.14       | 0.80       | 0.17       | 0.13       | 0.18       | 0.20       | 0.22       | 0.11       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 85                    | 85         | 81         | 81         | 76         | 78         | 73         | 77         | 76         | 79         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010                | <0.010     | 0.020      | 0.018      | 0.026      | 0.030      | <0.010     | 0.024      | <0.010     | 0.024      |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.256                 | 0.283      | 0.223      | 0.229      | 0.211      | 0.208      | 0.230      | 0.206      | 0.239      | 0.212      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15      | <0.15      | 0.16       | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.69                  | 2.64       | 2.57       | 2.52       | 2.46       | 2.95       | 2.31       | 2.46       | 2.45       | 2.64       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.71                  | 2.80       | 2.73       | 2.72       | 2.51       | 2.70       | 2.53       | 2.63       | 2.48       | 2.75       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0032                | 0.0052     | 0.0036     | 0.0039     | <0.0030    | 0.0032     | 0.0035     | 0.0042     | 0.0046     | 0.0031     |
|                        | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0011     | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 5.70                  | 5.78       | 5.53       | 5.52       | 5.25       | 5.28       | 4.88       | 5.22       | 5.03       | 5.32       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 13.5                  | 13.8       | 12.9       | 12.9       | 12.0       | 12.3       | 11.2       | 12.1       | 11.0       | 12.4       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | 0.0039                | 0.0046     | 0.0048     | 0.0034     | 0.0042     | 0.0047     | 0.0037     | 0.0089     | 0.0075     | 0.0148     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00011    | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0119                | 0.0123     | 0.0117     | 0.0114     | 0.0105     | 0.0104     | 0.0104     | 0.0108     | 0.0105     | 0.0101     |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.013                 | 0.014      | 0.012      | 0.012      | 0.011      | 0.011      | 0.010      | 0.011      | 0.011      | 0.011      |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 20.6                  | 20.8       | 19.8       | 20.1       | 18.2       | 18.3       | 18.0       | 19.2       | 18.5       | 17.7       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00105               | 0.00103    | 0.00100    | 0.00099    | 0.00090    | 0.00104    | 0.00096    | 0.00113    | 0.00103    | 0.00119    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0015                | 0.0015     | 0.0014     | 0.0014     | 0.0012     | 0.0013     | 0.0011     | 0.0012     | 0.0014     | 0.0012     |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 13.8                  | 14.2       | 13.5       | 13.2       | 12.5       | 12.6       | 12.1       | 12.7       | 12.5       | 11.7       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00382               | 0.00287    | 0.00162    | 0.00176    | 0.00165    | 0.00159    | 0.00286    | 0.00160    | 0.00397    | 0.00158    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000882              | 0.000924   | 0.000862   | 0.000860   | 0.000780   | 0.000789   | 0.000752   | 0.000822   | 0.000718   | 0.000906   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00088               | 0.00092    | 0.00087    | 0.00085    | 0.00078    | 0.00081    | 0.00077    | 0.00085    | 0.00076    | 0.00080    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.82                  | 1.95       | 1.78       | 1.75       | 1.58       | 1.64       | 1.55       | 1.65       | 1.60       | 1.55       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.83                  | 0.82       | 0.71       | 0.73       | 0.61       | 0.62       | 0.81       | 0.65       | 1.02       | 0.61       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 2.65                  | 2.71       | 2.55       | 2.48       | 2.35       | 2.42       | 2.31       | 2.43       | 2.40       | 2.31       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0170                | 0.0169     | 0.0165     | 0.0160     | 0.0150     | 0.0150     | 0.0148     | 0.0156     | 0.0148     | 0.0146     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00148               | 0.00148    | 0.00138    | 0.00142    | 0.00131    | 0.00137    | 0.00125    | 0.00137    | 0.00122    | 0.00125    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0092     |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Table C.52: Water Chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | DL0-02-6              | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   | DL0-02-8   | DL0-02-8   | DL0-02-3   | DL0-02-3   |
|                        |                                    |         |                                            |                             | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 28-Jul-20             | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 131                   | 133        | 129        | 133        | 122        | 131        | 118        | 130        | 118        | 131        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.13                  | 8.25       | 8.30       | 8.25       | 7.83       | 8.13       | 7.41       | 8.24       | 7.43       | 8.24       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 61.7                  | 63         | 62.9       | 66.4       | 53.4       | 58.4       | 53         | 61         | 56.3       | 63.1       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 68                    | 70         | 74         | 74         | 70         | 67         | 55         | 77         | 64         | 69         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.89                  | 0.75       | 0.82       | 0.75       | 0.90       | 0.73       | 1.59       | 0.69       | 1.51       | 0.72       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 49.6                  | 51.3       | 50.3       | 51.3       | 46.5       | 50.4       | 45.8       | 50.4       | 45.8       | 50.6       |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | 0.0153     | <0.0050    | 0.0132     | <0.0050    |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.0974                | 0.0809     | 0.0900     | 0.0791     | 0.101      | 0.0884     | 0.127      | 0.0818     | 0.129      | 0.0781     |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | 0.0013                | 0.0017     | 0.0016     | 0.0025     | 0.0013     | 0.0017     | 0.0019     | 0.0016     | 0.0016     | 0.0014     |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | 0.121                 | 0.121      | 0.121      | 0.115      | 0.113      | 0.183      | 0.114      | 0.121      | 0.119      | 0.126      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.80                  | 1.58       | 6.23       | 1.41       | 1.52       | 1.69       | 1.12       | 1.37       | 1.30       | 1.56       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 1.65                  | 1.71       | 1.71       | 1.89       | 1.58       | 1.76       | 1.53       | 1.66       | 1.63       | 1.79       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0072                | 0.0060     | 0.0059     | 0.0044     | 0.0065     | 0.0066     | 0.0083     | 0.0052     | 0.0058     | 0.0085     |
|                        | Phenols                            | mg/L    | 0.001 <sup>a</sup>                         | -                           | 0.0022                | 0.0025     | 0.0047     | 0.0029     | 0.0018     | <0.0010    | 0.0027     | 0.0023     | 0.0035     | 0.0022     |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.050                | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     | <0.050     |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 3.43                  | 3.40       | 3.30       | 3.36       | 3.11       | 3.31       | 3.08       | 3.32       | 3.07       | 3.36       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 10.0                  | 9.86       | 9.44       | 9.70       | 8.55       | 9.51       | 8.06       | 9.55       | 8.08       | 9.66       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | 0.0234                | 0.0174     | 0.0211     | 0.0199     | 0.0294     | 0.0202     | 0.0434     | 0.0186     | 0.0503     | 0.0192     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00668               | 0.00649    | 0.00628    | 0.00649    | 0.00632    | 0.00640    | 0.00623    | 0.00634    | 0.00634    | 0.00650    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.010                 | 0.010      | <0.010     | <0.010     | <0.010     | 0.010      | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 11.4                  | 11.8       | 11.3       | 11.7       | 10.6       | 11.7       | 10.3       | 11.4       | 10.9       | 11.7       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00010               | <0.00010   | 0.00017    | 0.00021    | 0.00014    | <0.00010   | 0.00015    | 0.00010    | 0.00011    | 0.00012    |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00078               | 0.00078    | 0.00077    | 0.00080    | 0.00084    | 0.00077    | 0.00076    | 0.00079    | 0.00072    | 0.00077    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | 0.031                 | 0.024      | 0.027      | 0.026      | 0.036      | 0.025      | 0.062      | 0.023      | 0.064      | 0.023      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000069   | <0.000050  | 0.000061   | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0011                | 0.0011     | 0.0011     | 0.0011     | <0.0010    | 0.0011     | 0.0010     | 0.0011     | 0.0014     | 0.0011     |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 6.87                  | 7.31       | 6.87       | 6.98       | 6.74       | 6.90       | 6.22       | 6.88       | 7.08       | 7.04       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00389               | 0.00349    | 0.00343    | 0.00352    | 0.00427    | 0.00325    | 0.0118     | 0.00321    | 0.0124     | 0.00335    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000683              | 0.000672   | 0.000655   | 0.000645   | 0.000576   | 0.000637   | 0.000545   | 0.000644   | 0.000537   | 0.000662   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00058               | 0.00060    | 0.00057    | 0.00062    | 0.00056    | 0.00062    | 0.00054    | 0.00062    | 0.00055    | 0.00063    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.05                  | 1.05       | 1.03       | 1.05       | 1.01       | 1.06       | 0.969      | 1.03       | 1.04       | 1.04       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.52                  | 0.49       | 0.49       | 0.48       | 0.51       | 0.51       | 0.75       | 0.50       | 0.79       | 0.48       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.38                  | 1.44       | 1.38       | 1.41       | 1.34       | 1.41       | 1.28       | 1.36       | 1.34       | 1.40       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00892               | 0.00887    | 0.00876    | 0.00884    | 0.00816    | 0.00876    | 0.00799    | 0.00866    | 0.00806    | 0.00897    |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.00137               | 0.00083    | 0.00105    | 0.00102    | 0.00163    | 0.00090    | 0.00267    | 0.00098    | 0.00276    | 0.00081    |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.000947              | 0.000964   | 0.000924   | 0.000948   | 0.000812   | 0.000925   | 0.000751   | 0.000935   | 0.000726   | 0.000931   |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.

Table C.52: Water Chemistry at Sheardown Lake SE (DLO-02) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Fall Sampling Event |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | DL0-02-6            | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   | DL0-02-8   | DL0-02-8   | DL0-02-3   | DL0-02-3   |
|                        |                                    |         |                                            |                             | bottom              | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 26-Aug-20           | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 142                 | 146        | 141        | 140        | 145        | 145        | 139        | 139        | 139        | 139        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.03                | 8.04       | 8          | 8.05       | 7.98       | 7.95       | 8.02       | 7.98       | 7.97       | 8.03       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 68.7                | 67.3       | 67.6       | 68.2       | 67.2       | 66.3       | 67.3       | 67.2       | 67.8       | 67.8       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.6                 | 2.5        | <2.0       | <2.0       | <2.0       | <2.0       | 2.6        | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 75                  | 83         | 71         | 89         | 74         | 89         | 81         | 72         | 60         | 76         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 2.16                | 2.22       | 2.23       | 2.28       | 2.53       | 2.43       | 2.40       | 2.39       | 2.16       | 2.40       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 56                  | 57         | 57         | 57         | 56         | 55         | 56         | 56         | 56         | 57         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | 0.011               | 0.012      | 0.013      | 0.013      | 0.013      | 0.014      | 0.012      | 0.013      | 0.012      | 0.012      |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.079               | 0.094      | 0.083      | 0.085      | 0.086      | 0.077      | 0.108      | 0.099      | 0.102      | 0.079      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050             | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15               | <0.15      | <0.15      | <0.15      | <0.15      | 0.16       | <0.15      | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.53                | 1.98       | 2.07       | 1.92       | 2.18       | 1.89       | 2.11       | 1.93       | 2.05       | 1.89       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.41                | 2.41       | 2.43       | 2.33       | 2.54       | 2.41       | 2.35       | 2.37       | 2.36       | 2.49       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>a</sup>                         | -                           | 0.0079              | 0.0068     | 0.014      | 0.0095     | 0.0101     | 0.009      | 0.0117     | 0.0088     | 0.0053     | 0.0067     |
|                        | Phenols                            | mg/L    | 0.001 <sup>a</sup>                         | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10               | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 3.92                | 4.00       | 3.97       | 3.90       | 3.85       | 3.87       | 3.90       | 3.87       | 3.88       | 3.86       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 9.76                | 9.78       | 9.88       | 9.65       | 9.33       | 9.35       | 9.44       | 9.52       | 9.44       | 9.43       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.179, 0.173 <sup>c</sup>   | 0.0585              | 0.0696     | 0.0615     | 0.0665     | 0.055      | 0.0467     | 0.0704     | 0.076      | 0.0671     | 0.0654     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>a</sup>                         | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00767             | 0.00782    | 0.00767    | 0.00823    | 0.00769    | 0.00754    | 0.00767    | 0.00818    | 0.00756    | 0.00757    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>a</sup>                         | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | 0.012               | 0.012      | 0.012      | 0.012      | 0.011      | 0.011      | 0.011      | 0.011      | 0.011      | 0.011      |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00009                     | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 13.5                | 13.4       | 13.9       | 13.9       | 12.6       | 13.3       | 13.3       | 13.1       | 13.4       | 13.4       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00082             | 0.0008     | 0.00082    | 0.00084    | 0.00091    | 0.00081    | 0.0008     | 0.0008     | 0.00083    | 0.00129    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.300                       | 0.061               | 0.064      | 0.060      | 0.066      | 0.062      | 0.059      | 0.068      | 0.069      | 0.064      | 0.069      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000055            | 0.000052   | 0.000055   | 0.000061   | 0.000056   | 0.000053   | 0.000071   | 0.000058   | 0.000059   | 0.000057   |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | 0.0014              | 0.0014     | 0.0013     | 0.0015     | <0.0010    | 0.0012     | 0.0012     | 0.0013     | 0.0012     | 0.0014     |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 8.35                | 8.33       | 8.47       | 8.42       | 8.18       | 8.13       | 8.31       | 8.46       | 8.48       | 8.35       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00345             | 0.00361    | 0.00355    | 0.00354    | 0.00373    | 0.00376    | 0.00369    | 0.00353    | 0.00363    | 0.0036     |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000645            | 0.000647   | 0.000666   | 0.000632   | 0.000658   | 0.000627   | 0.000629   | 0.000635   | 0.000622   | 0.000621   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.0006              | 0.00059    | 0.00061    | 0.00065    | 0.0006     | 0.00059    | 0.00063    | 0.00062    | 0.00061    | 0.00062    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.15                | 1.16       | 1.15       | 1.15       | 1.13       | 1.12       | 1.17       | 1.16       | 1.15       | 1.15       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.49                | 0.52       | 0.48       | 0.51       | 0.48       | 0.45       | 0.53       | 0.52       | 0.50       | 0.50       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.75                | 1.70       | 1.70       | 1.70       | 1.69       | 1.68       | 1.74       | 1.76       | 1.69       | 1.72       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0101              | 0.0102     | 0.0104     | 0.0102     | 0.0102     | 0.0102     | 0.0102     | 0.0103     | 0.0101     | 0.0101     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00121             | 0.00120    | 0.00119    | 0.00119    | 0.00114    | 0.00117    | 0.00119    | 0.00118    | 0.00117    | 0.00116    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Sheardown Lake.

<sup>c</sup> Benchmark is 0.179 mg/L and 0.173 mg/L for shallow and deep stations, respectively.



Table C.53: Dissolved Metal Concentrations at Sheardown Lake SE Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Winter Sampling Event |            |            |            |            |            |            |            |            |            | Summer Sampling Event |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|------------|------------|------------|------------|------------|
|                  |                 |       | DL0-02-6              | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   | DL0-02-8   | DL0-02-8   | DL0-02-3   | DL0-02-3   | DL0-02-6              | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   |
|                  |                 |       | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom                | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 15-Apr-20             | 15-Apr-20  | 15-Apr-20  | 15-Apr-20  | 14-Apr-20  | 14-Apr-20  | 14-Apr-20  | 14-Apr-20  | 15-Apr-20  | 15-Apr-20  | 28-Jul-20             | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0046                | <0.0030    | 0.0044     | <0.0030    | 0.0044     | <0.0030    | 0.0041     | <0.0030    | 0.0047     | <0.0030    | 0.0039                | 0.0089     | 0.0255     | 0.0066     | 0.0060     | 0.0053     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010   | 0.00010    | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.0119                | 0.0119     | 0.0115     | 0.0113     | 0.0105     | 0.0106     | 0.0102     | 0.0108     | 0.0110     | 0.0109     | 0.00673               | 0.00678    | 0.00675    | 0.00702    | 0.00611    | 0.00633    |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.000050             | <0.00025   | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Boron (B)       | mg/L  | 0.013                 | 0.013      | 0.013      | 0.012      | 0.011      | 0.011      | 0.011      | 0.011      | 0.011      | 0.012      | 0.011                 | <0.050     | 0.010      | 0.011      | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.0000050            | <0.000025  | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Calcium (Ca)    | mg/L  | 20.6                  | 20.3       | 20.4       | 20.1       | 18.5       | 18.7       | 17.8       | 19.1       | 18.6       | 19.3       | 11.9                  | 12.6       | 11.9       | 12.5       | 10.2       | 11.4       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00119               | 0.00098    | 0.00104    | 0.00106    | 0.00097    | 0.00103    | 0.00098    | 0.00103    | 0.00090    | 0.00095    | 0.00067               | <0.0010    | 0.00075    | 0.00081    | 0.00058    | 0.00062    |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.010                | <0.050     | 0.020      | <0.010     | <0.010     | <0.010     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050             | <0.00025   | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0015                | 0.0015     | 0.0015     | 0.0016     | 0.0013     | 0.0012     | 0.0011     | 0.0011     | 0.0014     | 0.0014     | 0.0010                | <0.0050    | 0.0010     | 0.0011     | <0.0010    | 0.0010     |
|                  | Magnesium (Mg)  | mg/L  | 13.8                  | 13.9       | 13.1       | 13.3       | 12.2       | 12.6       | 12.2       | 12.6       | 12.4       | 12.9       | 7.77                  | 7.69       | 8.04       | 8.54       | 6.75       | 7.27       |
|                  | Manganese (Mn)  | mg/L  | 0.000497              | 0.000294   | 0.000263   | 0.000303   | 0.000189   | 0.000275   | 0.000296   | 0.000242   | 0.000312   | 0.000218   | 0.00016               | 0.00067    | 0.00064    | 0.00053    | 0.00012    | 0.00033    |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000911              | 0.000883   | 0.000853   | 0.000864   | 0.000788   | 0.000807   | 0.000710   | 0.000816   | 0.000680   | 0.000856   | 0.000612              | 0.00061    | 0.000576   | 0.000625   | 0.000519   | 0.000588   |
|                  | Nickel (Ni)     | mg/L  | 0.00092               | 0.00088    | 0.00084    | 0.00093    | 0.00078    | 0.00081    | 0.00077    | 0.00083    | 0.00071    | 0.00080    | <0.00050              | <0.0025    | 0.00052    | 0.00054    | <0.00050   | 0.00052    |
|                  | Potassium (K)   | mg/L  | 1.90                  | 1.91       | 1.75       | 1.75       | 1.56       | 1.65       | 1.57       | 1.66       | 1.60       | 1.67       | 1.07                  | 1.15       | 1.08       | 1.11       | 0.975      | 1.01       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.000050             | <0.00025   | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Silicon (Si)    | mg/L  | 0.81                  | 0.82       | 0.72       | 0.74       | 0.62       | 0.62       | 0.80       | 0.63       | 0.98       | 0.65       | 0.411                 | 0.42       | 0.417      | 0.407      | 0.435      | 0.422      |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000050  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 2.71                  | 2.65       | 2.53       | 2.53       | 2.32       | 2.40       | 2.29       | 2.40       | 2.35       | 2.44       | 1.50                  | 1.57       | 1.55       | 1.61       | 1.32       | 1.41       |
|                  | Strontium (Sr)  | mg/L  | 0.0176                | 0.0171     | 0.0169     | 0.0168     | 0.0154     | 0.0160     | 0.0152     | 0.0158     | 0.0148     | 0.0160     | 0.00872               | 0.0094     | 0.00849    | 0.00892    | 0.00771    | 0.00826    |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.000010             | <0.000050  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00050   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.00030              | <0.0015    | 0.00126    | <0.00030   | <0.00030   | <0.00030   |
|                  | Uranium (U)     | mg/L  | 0.00144               | 0.00147    | 0.00143    | 0.00146    | 0.00133    | 0.00139    | 0.00126    | 0.00137    | 0.00124    | 0.00139    | 0.000930              | 0.000939   | 0.000863   | 0.000934   | 0.000789   | 0.000920   |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.00050              | <0.0025    | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0010               | <0.0050    | 0.0019     | <0.0010    | <0.0010    | <0.0010    |



Table C.53: Dissolved Metal Concentrations at Sheardown Lake SE Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Summer Sampling Event |            |            |            | Fall Sampling Event |            |            |            |            |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                  |                 |       | DL0-02-8              | DL0-02-8   | DL0-02-3   | DL0-02-3   | DL0-02-6            | DL0-02-6   | DL0-02-7   | DL0-02-7   | DL0-02-4   | DL0-02-4   | DL0-02-8   | DL0-02-8   | DL0-02-3   | DL0-02-3   |
|                  |                 |       | bottom                | surface    | bottom     | surface    | bottom              | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 28-Jul-20             | 28-Jul-20  | 28-Jul-20  | 28-Jul-20  | 26-Aug-20           | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  | 26-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0110                | 0.0067     | 0.0154     | 0.0091     | 0.0132              | 0.0125     | 0.012      | 0.0079     | 0.0106     | 0.0108     | 0.0091     | 0.0137     | 0.009      | 0.0089     |
|                  | Antimony (Sb)   | mg/L  | <0.00050              | <0.00050   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | <0.00050              | <0.00050   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.00616               | 0.00671    | 0.00632    | 0.00677    | 0.00727             | 0.00736    | 0.00769    | 0.00735    | 0.0074     | 0.00735    | 0.00722    | 0.00719    | 0.00722    | 0.00724    |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00010   | <0.00010   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.00025              | <0.00025   | <0.000050  | <0.000050  | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L  | <0.050                | <0.050     | <0.010     | 0.010      | 0.012               | 0.012      | 0.012      | 0.011      | 0.011      | 0.010      | 0.011      | 0.011      | 0.011      | 0.011      |
|                  | Cadmium (Cd)    | mg/L  | <0.000025             | <0.000025  | <0.0000050 | <0.0000050 | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L  | 10.6                  | 12.1       | 10.9       | 12.0       | 13.5                | 13.1       | 13.5       | 13.6       | 13.1       | 13.0       | 13.4       | 13.2       | 13.3       | 13.6       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | 0.00010    | <0.00010   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00050              | <0.00050   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | <0.0010               | <0.0010    | 0.00082    | 0.00072    | 0.00075             | 0.00071    | 0.00072    | 0.00072    | 0.00076    | 0.00072    | 0.0007     | 0.00072    | 0.0007     | 0.00072    |
|                  | Iron (Fe)       | mg/L  | <0.050                | <0.050     | 0.011      | <0.010     | <0.030              | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L  | <0.00025              | <0.00025   | <0.000050  | <0.000050  | <0.000050           | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | <0.0050               | <0.0050    | <0.0010    | 0.0010     | 0.0013              | 0.0012     | 0.0012     | 0.0013     | 0.0014     | 0.0012     | 0.0012     | 0.0012     | 0.0011     | 0.0013     |
|                  | Magnesium (Mg)  | mg/L  | 6.44                  | 7.50       | 7.08       | 8.06       | 8.48                | 8.43       | 8.23       | 8.32       | 8.39       | 8.22       | 8.20       | 8.31       | 8.39       | 8.22       |
|                  | Manganese (Mn)  | mg/L  | 0.00226               | <0.00050   | 0.00158    | 0.00056    | 0.000525            | 0.00058    | 0.000598   | 0.000451   | 0.000323   | 0.000353   | 0.000427   | 0.000399   | 0.000418   | 0.000437   |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.00050               | 0.00065    | 0.000501   | 0.000593   | 0.000626            | 0.000665   | 0.000628   | 0.000624   | 0.000633   | 0.00062    | 0.000631   | 0.000646   | 0.000611   | 0.000651   |
|                  | Nickel (Ni)     | mg/L  | <0.0025               | <0.0025    | <0.00050   | 0.00051    | 0.00052             | 0.00056    | 0.00054    | 0.00053    | 0.00052    | 0.00053    | 0.00054    | 0.00077    | 0.00053    | 0.00052    |
|                  | Potassium (K)   | mg/L  | 1.03                  | 1.14       | 0.986      | 1.07       | 1.15                | 1.14       | 1.13       | 1.12       | 1.13       | 1.11       | 1.13       | 1.13       | 1.10       | 1.11       |
|                  | Selenium (Se)   | mg/L  | <0.00025              | <0.00025   | <0.000050  | <0.000050  | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 0.64                  | 0.40       | 0.592      | 0.407      | 0.41                | 0.40       | 0.40       | 0.40       | 0.41       | 0.41       | 0.39       | 0.40       | 0.40       | 0.40       |
|                  | Silver (Ag)     | mg/L  | <0.000050             | <0.000050  | <0.000010  | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 1.37                  | 1.50       | 1.40       | 1.55       | 1.76                | 1.7        | 1.72       | 1.75       | 1.75       | 1.71       | 1.68       | 1.72       | 1.72       | 1.68       |
|                  | Strontium (Sr)  | mg/L  | 0.0082                | 0.0093     | 0.00767    | 0.00850    | 0.0101              | 0.0101     | 0.01       | 0.00997    | 0.0102     | 0.01       | 0.0101     | 0.0101     | 0.01       | 0.00987    |
|                  | Thallium (Tl)   | mg/L  | <0.000050             | <0.000050  | <0.000010  | <0.000010  | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00050              | <0.00050   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.0015               | <0.0015    | 0.00038    | <0.00030   | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.000721              | 0.000923   | 0.000709   | 0.000904   | 0.00117             | 0.00118    | 0.00117    | 0.00116    | 0.00114    | 0.00115    | 0.00115    | 0.00114    | 0.00116    | 0.00116    |
|                  | Vanadium (V)    | mg/L  | <0.0025               | <0.0025    | <0.00050   | <0.00050   | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0050               | <0.0050    | <0.0010    | <0.0010    | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

**Table C.54: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Sheardown Lake Southeast and Reference Lake 3 in 2020, and at Sheardown Lake Southeast Between 2020 and the Baseline Period**

| Dissolved Metal | Sheardown Lake SE        |      |                  |        |      |
|-----------------|--------------------------|------|------------------|--------|------|
|                 | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      |
|                 | Summer                   | Fall | Winter           | Summer | Fall |
| Aluminum (Al)   | 0.8                      | 2.5  | 0.0              | 2.1    | 3.6  |
| Antimony (Sb)   | 2.2                      | 1.0  | 0.0              | 0.0    | 1.0  |
| Arsenic (As)    | 2.2                      | 1.0  | 1.0              | 1.9    | 1.0  |
| Barium (Ba)     | 1.1                      | 1.1  | 0.0              | 1.3    | 1.3  |
| Beryllium (Be)  | 0.4                      | 1.0  | 1.2              | 0.5    | 2.1  |
| Bismuth (Bi)    | 0.2                      | 1.0  | 1.0              | 0.1    | 1.0  |
| Boron (B)       | 2.2                      | 1.1  | 1.2              | 2.3    | 1.1  |
| Cadmium (Cd)    | 1.1                      | 1.0  | 0.4              | 0.0    | 0.8  |
| Calcium (Ca)    | 1.7                      | 1.8  | 1.5              | 1.0    | 1.1  |
| Chromium (Cr)   | 0.4                      | 1.0  | -                | 2.0    | -    |
| Cobalt (Co)     | 2.2                      | 1.0  | 1.0              | 2.2    | 0.9  |
| Copper (Cu)     | 1.1                      | 1.0  | 0.8              | 0.5    | 0.9  |
| Iron (Fe)       | 0.8                      | 1.0  | 1.2              | 1.0    | 1.7  |
| Lead (Pb)       | 2.2                      | 1.0  | 0.6              | 2.2    | 1.0  |
| Lithium (Li)    | 2.2                      | 1.2  | 0.3              | 0.1    | 0.5  |
| Magnesium (Mg)  | 1.8                      | 1.7  | 1.6              | 1.1    | 1.2  |
| Manganese (Mn)  | 3.3                      | 3.3  | 0.5              | 0.0    | 0.7  |
| Mercury (Hg)    | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  |
| Molybdenum (Mo) | 4.4                      | 4.1  | 3.6              | 0.0    | 3.1  |
| Nickel (Ni)     | 2.2                      | 1.1  | 1.2              | 1.2    | 1.0  |
| Potassium (K)   | 1.2                      | 1.2  | 1.1              | 1.0    | 0.9  |
| Selenium (Se)   | 0.1                      | 1.0  | -                | 1.1    | -    |
| Silicon (Si)    | 1.0                      | 0.8  | 1.5              | 1.1    | 1.0  |
| Silver (Ag)     | 2.2                      | 1.0  | 1.2              | -      | 2.7  |
| Sodium (Na)     | 1.6                      | 1.7  | 1.5              | 1.2    | 1.3  |
| Strontium (Sr)  | 1.0                      | 1.2  | 2.1              | 1.2    | 1.3  |
| Thallium (Tl)   | 0.2                      | 1.0  | 1.2              | 0.3    | 2.6  |
| Tin (Sn)        | 2.2                      | 1.0  | 0.1              | 0.4    | 0.1  |
| Titanium (Ti)   | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  |
| Uranium (U)     | 2.8                      | 3.5  | 2.8              | 1.9    | 2.3  |
| Vanadium (V)    | 1.1                      | 1.0  | 1.0              | 1.1    | 1.0  |
| Zinc (Zn)       | 0.8                      | 1.0  | 1.5              | 0.8    | 1.9  |

|  |                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).                 |
|  | Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).              |
|  | Denotes highly elevated concentration (mean concentration $\geq 10$ times higher than respective mean reference or baseline period value). |
|  | Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.      |

**Table C.55: *In Situ* Water Quality Measurements Collected at Mary River Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Study Area                    | Station  | Date Sampled | Temperature (°C) | Dissolved Oxygen (mg/L) | Dissolved Oxygen (% Saturation) | pH (pH units) | Specific Conductance (µS/cm) |
|-------------------------------|----------|--------------|------------------|-------------------------|---------------------------------|---------------|------------------------------|
| Mary River Upstream (GO-09)   | GO-09 B1 | 10-Aug-20    | 10.5             | 10.09                   | 95.6                            | 8.25          | 208.9                        |
|                               | GO-09 B2 | 10-Aug-20    | 10.0             | 10.28                   | 96.3                            | 8.24          | 195.1                        |
|                               | GO-09 B3 | 10-Aug-20    | 9.5              | 10.43                   | 96.7                            | 8.20          | 194.1                        |
|                               | GO-09 B4 | 10-Aug-20    | 9.3              | 10.72                   | 100.4                           | 8.25          | 194.7                        |
|                               | GO-09 B5 | 10-Aug-20    | 9.0              | 10.73                   | 98.1                            | 8.07          | 180.5                        |
| Mary River Upstream (GO-03)   | GO-03 B1 | 10-Aug-20    | 11.6             | 9.41                    | 90.9                            | 8.15          | 191.0                        |
|                               | GO-03 B2 | 10-Aug-20    | 11.0             | 9.55                    | 91.4                            | 8.13          | 191.0                        |
|                               | GO-03 B3 | 10-Aug-20    | 11.2             | 9.75                    | 93.0                            | 7.99          | 191.7                        |
|                               | GO-03 B4 | 10-Aug-20    | 11.1             | 10.01                   | 95.3                            | 7.99          | 192.0                        |
|                               | GO-03 B5 | 10-Aug-20    | 10.8             | 10.05                   | 95.2                            | 8.17          | 192.1                        |
| Mary River Downstream (EO-01) | EO-01 B1 | 13-Aug-20    | 5.1              | 12.49                   | 98.0                            | 8.25          | 225.3                        |
|                               | EO-01 B2 | 13-Aug-20    | 5.1              | 12.53                   | 98.4                            | 8.26          | 225.4                        |
|                               | EO-01 B3 | 13-Aug-20    | 5.0              | 12.57                   | 98.4                            | 8.24          | 225.3                        |
|                               | EO-01 B4 | 11-Aug-20    | 9.5              | 11.14                   | 97.6                            | 8.26          | 216.0                        |
|                               | EO-01 B5 | 11-Aug-20    | 9.4              | 11.16                   | 97.4                            | 8.27          | 216.2                        |
| Mary River Downstream (EO-20) | EO-20 B1 | 11-Aug-20    | 9.6              | 11.49                   | 100.6                           | 8.36          | 218.7                        |
|                               | EO-20 B2 | 11-Aug-20    | 9.3              | 11.52                   | 100.4                           | 8.28          | 219.4                        |
|                               | EO-20 B3 | 11-Aug-20    | 9.1              | 11.52                   | 99.9                            | 8.24          | 219.1                        |
|                               | EO-20 B4 | 11-Aug-20    | 8.9              | 11.58                   | 100.1                           | 8.71          | 219.1                        |
|                               | EO-20 B5 | 11-Aug-20    | 8.6              | 11.69                   | 99.8                            | 8.27          | 218.9                        |
| Mary River Downstream (CO-05) | CO-05 B1 | 11-Aug-20    | 8.9              | 11.68                   | 100.7                           | 8.12          | 208.7                        |
|                               | CO-05 B2 | 11-Aug-20    | 8.5              | 11.68                   | 100.1                           | 8.19          | 209.3                        |
|                               | CO-05 B3 | 11-Aug-20    | 8.2              | 11.68                   | 99.2                            | 8.16          | 209.8                        |
|                               | CO-05 B4 | 11-Aug-20    | 7.9              | 11.66                   | 98.0                            | 8.14          | 209.9                        |
|                               | CO-05 B5 | 11-Aug-20    | 8.1              | 11.61                   | 93.3                            | 8.06          | 209.9                        |

**Table C.56: *In Situ* Water Quality Summary for Mary River Benthic Invertebrate Community Study Areas, Mary River Project CREMP, August 2020**

| Metric                          | Station | Sample Size | Mean  | Standard Deviation | Standard Error | 95% Confidence Interval |             | Minimum | Maximum |
|---------------------------------|---------|-------------|-------|--------------------|----------------|-------------------------|-------------|---------|---------|
|                                 |         |             |       |                    |                | Lower Bound             | Upper Bound |         |         |
| Temperature (°C)                | GO-09   | 5           | 9.66  | 0.59               | 0.27           | 9.22                    | 10.10       | 9.00    | 10.50   |
|                                 | GO-03   | 5           | 11.14 | 0.30               | 0.13           | 10.92                   | 11.36       | 10.80   | 11.60   |
|                                 | EO-01   | 5           | 6.82  | 2.40               | 1.07           | 5.05                    | 8.59        | 5.00    | 9.50    |
|                                 | EO-20   | 5           | 9.10  | 0.38               | 0.17           | 8.82                    | 9.38        | 8.60    | 9.60    |
|                                 | CO-05   | 5           | 8.32  | 0.39               | 0.17           | 8.03                    | 8.61        | 7.90    | 8.90    |
| Dissolved Oxygen (mg/L)         | GO-09   | 5           | 10.5  | 0.3                | 0.1            | 10.2                    | 10.7        | 10.1    | 10.7    |
|                                 | GO-03   | 5           | 9.8   | 0.3                | 0.1            | 9.5                     | 10.0        | 9.4     | 10.1    |
|                                 | EO-01   | 5           | 12.0  | 0.8                | 0.3            | 11.4                    | 12.5        | 11.1    | 12.6    |
|                                 | EO-20   | 5           | 11.6  | 0.1                | 0.0            | 11.5                    | 11.6        | 11.5    | 11.7    |
|                                 | CO-05   | 5           | 11.7  | 0.0                | 0.0            | 11.6                    | 11.7        | 11.6    | 11.7    |
| Dissolved Oxygen (% saturation) | GO-09   | 5           | 97.4  | 1.9                | 0.8            | 96.0                    | 98.8        | 95.6    | 100.4   |
|                                 | GO-03   | 5           | 93.2  | 2.1                | 0.9            | 91.6                    | 94.7        | 90.9    | 95.3    |
|                                 | EO-01   | 5           | 98.0  | 0.5                | 0.2            | 97.6                    | 98.3        | 97.4    | 98.4    |
|                                 | EO-20   | 5           | 100.2 | 0.3                | 0.2            | 99.9                    | 100.4       | 99.8    | 100.6   |
|                                 | CO-05   | 5           | 98.3  | 3.0                | 1.3            | 96.1                    | 100.4       | 93.3    | 100.7   |
| pH (pH units)                   | GO-09   | 5           | 8.20  | 0.08               | 0.03           | 8.15                    | 8.26        | 8.07    | 8.25    |
|                                 | GO-03   | 5           | 8.09  | 0.09               | 0.04           | 8.02                    | 8.15        | 7.99    | 8.17    |
|                                 | EO-01   | 5           | 8.26  | 0.01               | 0.01           | 8.25                    | 8.26        | 8.24    | 8.27    |
|                                 | EO-20   | 5           | 8.37  | 0.19               | 0.09           | 8.23                    | 8.51        | 8.24    | 8.71    |
|                                 | CO-05   | 5           | 8.13  | 0.05               | 0.02           | 8.10                    | 8.17        | 8.06    | 8.19    |
| Specific Conductance (µS/cm)    | GO-09   | 5           | 194.7 | 10.0               | 4.5            | 187.3                   | 202.1       | 180.5   | 208.9   |
|                                 | GO-03   | 5           | 191.6 | 0.5                | 0.2            | 191.2                   | 192.0       | 191.0   | 192.1   |
|                                 | EO-01   | 5           | 221.6 | 5.1                | 2.3            | 217.9                   | 225.4       | 216.0   | 225.4   |
|                                 | EO-20   | 5           | 219.0 | 0.3                | 0.1            | 218.8                   | 219.2       | 218.7   | 219.4   |
|                                 | CO-05   | 5           | 209.5 | 0.5                | 0.2            | 209.1                   | 209.9       | 208.7   | 209.9   |

**Table C.57: Statistical Comparison of *In Situ* Water Quality Variables Among Mary River Benthic Invertebrate Community Study Areas, Mary River Project CREMP, August 2020**

| <i>In Situ</i> Variable         | Overall 5-group Comparison    |                 |                                       |         | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |          |                                       |         |
|---------------------------------|-------------------------------|-----------------|---------------------------------------|---------|-----------------------------------------------------|----------|---------------------------------------|---------|
|                                 | Statistical Test <sup>a</sup> | Transform-ation | Significant Difference Between Areas? | P-value | (I) Area                                            | (J) Area | Significant Difference Between Areas? | P-value |
| Temperature (°C)                | K-W                           | rank            | YES                                   | 0.00200 | GO-09                                               | GO-03    | NO                                    | 0.132   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-01    | YES                                   | 0.068   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-20    | NO                                    | 0.414   |
|                                 |                               |                 |                                       |         | GO-09                                               | CO-05    | YES                                   | 0.037   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-01    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-20    | YES                                   | 0.02    |
|                                 |                               |                 |                                       |         | GO-03                                               | CO-05    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | EO-01                                               | EO-20    | NO                                    | 0.312   |
|                                 |                               |                 |                                       |         | EO-01                                               | CO-05    | NO                                    | 0.796   |
|                                 |                               |                 |                                       |         | EO-20                                               | CO-05    | NO                                    | 0.205   |
| Dissolved Oxygen (mg/L)         | ANOVA                         | none            | YES                                   | 0.00100 | GO-09                                               | GO-03    | YES                                   | 0.064   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-01    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-20    | YES                                   | 0.002   |
|                                 |                               |                 |                                       |         | GO-09                                               | CO-05    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-01    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-20    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | CO-05    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | EO-01                                               | EO-20    | NO                                    | 0.443   |
|                                 |                               |                 |                                       |         | EO-01                                               | CO-05    | NO                                    | 0.693   |
|                                 |                               |                 |                                       |         | EO-20                                               | CO-05    | NO                                    | 0.993   |
| Dissolved Oxygen (% Saturation) | ANOVA                         | none            | YES                                   | 0.001   | GO-09                                               | GO-03    | YES                                   | 0.012   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-01    | NO                                    | 0.99    |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-20    | NO                                    | 0.168   |
|                                 |                               |                 |                                       |         | GO-09                                               | CO-05    | NO                                    | 0.949   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-01    | YES                                   | 0.004   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-20    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | CO-05    | YES                                   | 0.002   |
|                                 |                               |                 |                                       |         | EO-01                                               | EO-20    | NO                                    | 0.353   |
|                                 |                               |                 |                                       |         | EO-01                                               | CO-05    | NO                                    | 0.999   |
|                                 |                               |                 |                                       |         | EO-20                                               | CO-05    | NO                                    | 0.494   |
| pH (pH units)                   | K-W                           | rank            | YES                                   | 0.001   | GO-09                                               | GO-03    | NO                                    | 0.111   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-01    | NO                                    | 0.236   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-20    | YES                                   | 0.061   |
|                                 |                               |                 |                                       |         | GO-09                                               | CO-05    | NO                                    | 0.212   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-01    | YES                                   | 0.005   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-20    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | CO-05    | NO                                    | 0.73    |
|                                 |                               |                 |                                       |         | EO-01                                               | EO-20    | NO                                    | 0.491   |
|                                 |                               |                 |                                       |         | EO-01                                               | CO-05    | YES                                   | 0.015   |
|                                 |                               |                 |                                       |         | EO-20                                               | CO-05    | YES                                   | 0.002   |
| Specific Conductance (uS/cm)    | K-W                           | rank            | YES                                   | 0.001   | GO-09                                               | GO-03    | NO                                    | 0.491   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-01    | YES                                   | 0.003   |
|                                 |                               |                 |                                       |         | GO-09                                               | EO-20    | YES                                   | 0.006   |
|                                 |                               |                 |                                       |         | GO-09                                               | CO-05    | NO                                    | 0.229   |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-01    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | EO-20    | YES                                   | <0.001  |
|                                 |                               |                 |                                       |         | GO-03                                               | CO-05    | YES                                   | 0.058   |
|                                 |                               |                 |                                       |         | EO-01                                               | EO-20    | NO                                    | 0.83    |
|                                 |                               |                 |                                       |         | EO-01                                               | CO-05    | YES                                   | 0.078   |
|                                 |                               |                 |                                       |         | EO-20                                               | CO-05    | NO                                    | 0.122   |

Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

Table C.58: Water Chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Spring Sampling Event |                 |            |            |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | G0-09-A               | G0-09           | G0-09-B    | G0-03      | G0-01      | F0-01      | E0-10      | E0-03      | E0-21      | E0-20      | C0-10      | C0-05      | C0-01      |
|                        |                                    |         |                                            |                             | 04-Jul-20             | 04-Jul-20       | 04-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 72.0                  | 67.2            | 44.4       | 47.7       | 43.2       | 108        | 78.5       | 45.4       | 42.7       | 43.4       | 46.8       | 70.9       | 54.7       |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.83                  | 7.83            | 7.55       | 7.64       | 7.63       | 7.89       | 7.83       | 7.66       | 7.65       | 7.54       | 7.65       | 7.73       | 7.61       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 32.5                  | 31.7            | 19         | 20.7       | 19.3       | 49.9       | 35.3       | 20.8       | 19.7       | 20.2       | 19.3       | 32.2       | 23.6       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0            | <2.0       | 18.5       | 10.6       | 9.8        | 9.0        | 8.3        | 8.8        | 7.7        | 6.3        | 7.4        | 9.4        |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 60                    | 69              | 70         | 79         | 53         | 90         | 88         | 69         | 72         | 67         | 65         | 77         | 77         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 1.17                  | 2.60            | 9.05       | 7.76       | 6.81       | 2.19       | 4.37       | 6.91       | 7.11       | 6.79       | 7.72       | 7.43       | 10.2       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 35                    | 32              | 21         | 22         | 20         | 39         | 47         | 21         | 20         | 21         | 19         | 29         | 24         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010                | <0.010          | 0.011      | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | <0.020                | <0.020          | 0.022      | 0.040      | <0.020     | 0.187      | 0.099      | 0.031      | 0.023      | 0.020      | 0.163      | 0.061      | 0.042      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050         | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15           | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.84                  | 1.56            | 1.50       | 2.19       | 2.34       | 2.12       | 2.55       | 2.11       | 2.14       | 2.15       | 2.15       | 2.27       | 2.12       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.55                  | 2.12            | 2.03       | 2.71       | 2.77       | 2.94       | 2.68       | 3.00       | 2.95       | 3.15       | 3.16       | 3.44       | 3.18       |
|                        | Total Phosphorus                   | mg/L    | 0.030 <sup>α</sup>                         | -                           | 0.0205                | 0.0036          | 0.0122     | 0.0609     | 0.0504     | 0.0377     | 0.0681     | 0.0266     | 0.0676     | 0.0295     | 0.0189     | 0.0665     | 0.0240     |
|                        | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | 0.0025                | <0.0010         | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0016     | 0.0012     | <0.0010    | 0.0013     | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10           | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 1.05                  | 0.94            | 1.11       | 2.07       | 1.04       | 1.34       | 1.26       | 1.01       | 0.98       | 0.95       | 0.99       | 1.77       | 1.30       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 0.67                  | 0.73            | 0.65       | 0.63       | 0.53       | 11.8       | 6.67       | 2.00       | 1.58       | 1.36       | 2.36       | 3.44       | 1.97       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.966                       | 0.0551                | 0.112           | 0.197      | 0.241      | 0.219      | 0.170      | 0.234      | 0.196      | 0.221      | 0.213      | 0.212      | 0.155      | 0.244      |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | <0.00010              | <0.00010        | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | 0.00012         | <0.00010   | 0.00013    | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00462               | 0.00530         | 0.00474    | 0.00567    | 0.00467    | 0.00544    | 0.00529    | 0.00465    | 0.00467    | 0.00458    | 0.00447    | 0.00556    | 0.00532    |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010          | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | <0.000010             | <b>0.000064</b> | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | 0.000011   | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 6.95                  | 7.30            | 4.21       | 5.47       | 4.10       | 9.35       | 6.90       | 4.24       | 3.94       | 3.98       | 3.94       | 6.62       | 4.90       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050        | <0.00050   | 0.00064    | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010              | <0.00010        | <0.00010   | 0.00022    | 0.00011    | 0.00016    | 0.00013    | 0.00011    | 0.00010    | <0.00010   | <0.00010   | 0.00011    | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00056               | <b>0.00670</b>  | 0.00092    | 0.00109    | 0.00079    | 0.00051    | 0.00065    | 0.00075    | 0.00073    | 0.00074    | 0.00072    | 0.00106    | 0.00065    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.874                       | <0.030                | 0.102           | 0.181      | 0.363      | 0.199      | 0.202      | 0.232      | 0.192      | 0.180      | 0.198      | 0.181      | 0.179      | 0.184      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | 0.000387        | 0.000260   | 0.000447   | 0.000236   | 0.000212   | 0.000184   | 0.000219   | 0.000214   | 0.000216   | 0.000214   | 0.000235   | 0.000159   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.06                  | 3.66            | 2.43       | 2.75       | 2.42       | 6.67       | 4.68       | 2.75       | 2.50       | 2.60       | 2.48       | 4.00       | 3.26       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.000824              | 0.00299         | 0.00376    | 0.00922    | 0.00514    | 0.00905    | 0.00669    | 0.00477    | 0.00405    | 0.00410    | 0.00401    | 0.00686    | 0.00415    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050      | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000068              | 0.000087        | 0.000060   | <0.000050  | 0.000053   | 0.000099   | 0.000088   | 0.000053   | 0.000070   | 0.000074   | 0.000076   | 0.000176   | 0.000091   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050              | 0.00338         | <0.00050   | 0.00063    | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | 0.00061    | 0.00057    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.53                  | 0.76            | 0.53       | 0.52       | 0.50       | 0.65       | 0.58       | 0.49       | 0.49       | 0.49       | 0.49       | 0.66       | 0.62       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010         | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.67                  | 0.66            | 0.73       | 0.74       | 0.78       | 0.64       | 0.81       | 0.69       | 0.79       | 0.78       | 0.74       | 0.64       | 0.87       |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 0.783                 | 1.02            | 0.818      | 0.601      | 0.657      | 0.439      | 0.543      | 0.580      | 0.569      | 0.580      | 0.597      | 0.902      | 0.789      |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00571               | 0.00584         | 0.00465    | 0.00505    | 0.00419    | 0.00994    | 0.00745    | 0.00456    | 0.00426    | 0.00409    | 0.00403    | 0.00565    | 0.00475    |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010        | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | 0.00101         | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010          | 0.010      | 0.017      | 0.012      | 0.011      | 0.014      | 0.010      | 0.011      | 0.011      | 0.010      | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.000441              | 0.000389        | 0.000304   | 0.000358   | 0.000274   | 0.000349   | 0.000328   | 0.000265   | 0.000245   | 0.000241   | 0.000242   | 0.000462   | 0.000210   |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010               | <0.0010         | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <b>0.0320</b>   | 0.0033     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0041     | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.

Table C.58: Water Chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |            |            |            |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | G0-09-A               | G0-09      | G0-09-B    | G0-03      | G0-01      | F0-01      | E0-10      | E0-03      | E0-21      | E0-20      | C0-10      | C0-05      | C0-01      |
|                        |                                    |         |                                            |                             | 03-Aug-20             | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 31-Jul-20  | 31-Jul-20  | 31-Jul-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 189                   | 190        | 180        | 169        | 173        | 345        | 177        | 179        | 179        | 178        | 178        | 174        | 176        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.22                  | 8.23       | 8.22       | 8.09       | 8.18       | 8.30       | 8.18       | 8.16       | 8.17       | 8.17       | 8.25       | 8.21       | 8.19       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 84.4                  | 83.2       | 75.7       | 73         | 75.5       | 166        | 78.3       | 76.9       | 77.2       | 76.4       | 75         | 75.1       | 75.7       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 6.8                   | 21.2       | 9.8        | 13.6       | 6.9        | <2.0       | 8.2        | 11.5       | 16.1       | 14.1       | 9.1        | 17.9       | 18.3       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 114                   | 93         | 83         | 95         | 110        | 190        | 116        | 113        | 121        | 112        | 106        | 107        | 107        |
|                        | Turbidity                          | NTU     | -                                          | -                           | 16.3                  | 37.2       | 25.5       | 45.6       | 23.3       | 0.41       | 30.4       | 40.6       | 43.2       | 40.0       | 21.8       | 33.2       | 33.5       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 84                    | 80         | 76         | 72         | 84         | 122        | 86         | 87         | 82         | 78         | 84         | 81         | 82         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | 0.011      | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.139                 | 0.156      | 0.145      | 0.124      | 0.078      | 0.714      | 0.106      | 0.129      | 0.133      | 0.165      | 0.164      | 0.173      | 0.175      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | 0.16       | <0.15      | <0.15      | <0.15      | 0.32       | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.68                  | 4.53       | 3.81       | 4.31       | 3.70       | 1.69       | 4.04       | 3.95       | 1.87       | 2.23       | 2.20       | 2.53       | 2.94       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.9                   | 2.5        | 3.4        | <2.5       | 3.02       | 2.74       | 3.12       | 3.35       | 3.17       | 3.32       | 3.06       | 3.32       | 3.41       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>α</sup>                         | -                           | 0.0220                | 0.0243     | 0.0182     | 0.0316     | 0.0133     | <0.0030    | 0.0180     | 0.0253     | 0.0275     | 0.0251     | 0.0203     | 0.0241     | 0.0246     |
|                        | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | <0.0010               | 0.0013     | 0.0012     | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0010     |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 9.45                  | 8.36       | 8.94       | 8.08       | 7.48       | 13.7       | 7.68       | 7.78       | 7.77       | 7.31       | 7.43       | 7.57       | 7.54       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 5.69                  | 5.19       | 5.63       | 4.76       | 4.95       | 36.0       | 5.95       | 6.45       | 6.97       | 6.38       | 6.28       | 6.14       | 5.93       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.966                       | 0.868                 | 1.27       | 1.00       | 1.77       | 0.889      | 0.0337     | 1.19       | 1.51       | 1.56       | 0.0243     | 0.846      | 1.21       | 1.55       |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | 0.00018               | 0.00025    | 0.00020    | 0.00030    | 0.00019    | <0.00010   | 0.00022    | 0.00028    | 0.00027    | <0.00010   | 0.00019    | 0.00026    | 0.00024    |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0155                | 0.0171     | 0.0152     | 0.0204     | 0.0151     | 0.0165     | 0.0161     | 0.0185     | 0.0191     | 0.0102     | 0.0145     | 0.0173     | 0.0151     |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | 0.0000063             | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | 0.0000121  | 0.0000096  | <0.0000050 | 0.0000056  | <0.0000050 | 0.0000060  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 16.4                  | 16.7       | 15.0       | 14.9       | 14.1       | 29.4       | 15.0       | 15.4       | 15.6       | 15.5       | 14.4       | 15.7       | 15.5       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | 0.00167               | 0.00256    | 0.00171    | 0.00356    | 0.00163    | <0.00050   | 0.00218    | 0.00306    | 0.00325    | <0.00050   | 0.00142    | 0.00270    | 0.00142    |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | 0.00034               | 0.00056    | 0.00036    | 0.00074    | 0.00034    | <0.00010   | 0.00044    | 0.00064    | 0.00069    | <0.00010   | 0.00031    | 0.00058    | 0.00034    |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.0019                | 0.0024     | 0.0019     | 0.0030     | 0.0019     | <0.0010    | 0.0022     | 0.0029     | 0.0031     | <0.0010    | 0.0018     | 0.0025     | 0.0021     |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.874                       | 0.748                 | 1.22       | 0.855      | 1.71       | 0.719      | 0.028      | 1.01       | 1.44       | 1.38       | 0.013      | 0.660      | 1.34       | 0.759      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000587              | 0.000934   | 0.000661   | 0.00125    | 0.000532   | <0.000050  | 0.000745   | 0.00105    | 0.00117    | <0.000050  | 0.000497   | 0.000936   | 0.000798   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 9.03                  | 9.37       | 8.63       | 8.68       | 8.92       | 21.4       | 8.81       | 9.32       | 9.44       | 8.90       | 9.12       | 9.19       | 8.91       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00948               | 0.0160     | 0.0101     | 0.0201     | 0.00919    | 0.00103    | 0.0119     | 0.0180     | 0.0188     | <0.00050   | 0.00914    | 0.0173     | 0.0132     |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | 0.0000051  | <0.0000050 | 0.0000051  | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000458              | 0.000399   | 0.000434   | 0.000398   | 0.000360   | 0.000491   | 0.000382   | 0.000574   | 0.000597   | 0.000647   | 0.000453   | 0.000484   | 0.000263   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | 0.00121               | 0.00180    | 0.00130    | 0.00253    | 0.00154    | 0.00057    | 0.00166    | 0.00234    | 0.00279    | 0.00051    | 0.00134    | 0.00220    | 0.00147    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.62                  | 1.69       | 1.63       | 1.84       | 1.58       | 1.81       | 1.61       | 1.78       | 1.83       | 1.26       | 1.50       | 1.69       | 1.48       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000070   | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 1.93                  | 2.72       | 2.11       | 3.56       | 1.85       | 1.00       | 2.35       | 3.09       | 3.00       | 0.74       | 1.86       | 3.51       | 1.73       |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 4.94                  | 4.29       | 4.58       | 3.98       | 4.02       | 3.23       | 3.75       | 3.94       | 3.88       | 3.66       | 3.82       | 3.89       | 4.01       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0225                | 0.0211     | 0.0207     | 0.0202     | 0.0173     | 0.0414     | 0.0189     | 0.0200     | 0.0206     | 0.0181     | 0.0178     | 0.0204     | 0.0193     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | 0.000021              | 0.000030   | 0.000021   | 0.000041   | 0.000021   | <0.000010  | 0.000025   | 0.000032   | 0.000037   | <0.000010  | 0.000019   | 0.000034   | 0.000024   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | 0.0518                | 0.0837     | 0.0593     | 0.112      | 0.0526     | 0.00167    | 0.0694     | 0.0932     | 0.0970     | 0.00070    | 0.0534     | 0.0756     | 0.0944     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00584               | 0.00522    | 0.00509    | 0.00420    | 0.00389    | 0.00369    | 0.00400    | 0.00407    | 0.00414    | 0.00336    | 0.00334    | 0.00374    | 0.00382    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | 0.00161               | 0.00240    | 0.00176    | 0.00327    | 0.00167    | <0.00050   | 0.00202    | 0.00276    | 0.00294    | <0.00050   | 0.00142    | 0.00242    | 0.00150    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | 0.0197                | 0.0032     | <0.0030    | 0.0044     | <0.0030    | <0.0030    | <0.0030    | 0.0061     | 0.0043     | <0.0030    | <0.0030    | 0.0032     | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.



Table C.58: Water Chemistry at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Fall Sampling Event |            |            |            |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | G0-09-A             | G0-09      | G0-09-B    | G0-03      | GO-01      | F0-01      | E0-10      | EO-03      | EO-21      | EO-20      | C0-10      | C0-05      | CO-01      |
|                        |                                    |         |                                            |                             | 28-Aug-20           | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 252                 | 250        | 243        | 226        | 229        | 403        | 259        | 240        | 240        | 240        | 239        | 232        | 232        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 8.34                | 8.37       | 8.29       | 8.75       | 8.20       | 8.32       | 8.22       | 8.13       | 8.20       | 8.20       | 8.21       | 8.14       | 8.16       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 126                 | 123        | 110        | 104        | 108        | 211        | 127        | 114        | 114        | 114        | 112        | 113        | 110        |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                | <2.0       | 2.4        | 3.6        | 2.0        | <2.0       | <2.0       | 3.2        | <2.0       | 2.8        | 2.0        | <2.0       | 2.0        |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 134                 | 127        | 127        | 113        | 124        | 224        | 126        | 123        | 131        | 132        | 124        | 122        | 134        |
|                        | Turbidity                          | NTU     | -                                          | -                           | 0.36                | 3.06       | 4.96       | 4.16       | 5.21       | 0.61       | 4.61       | 6.18       | 6.97       | 6.89       | 4.26       | 3.05       | 2.70       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 111                 | 105        | 94         | 89         | 92         | 132        | 100        | 95         | 93         | 93         | 95         | 94         | 93         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | -                                          | 0.855                       | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | 0.012      | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.026               | 0.103      | 0.180      | 0.161      | 0.164      | 1.09       | 0.324      | 0.230      | 0.228      | 0.252      | 0.240      | 0.216      | 0.230      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050             | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15               | <0.15      | <0.15      | <0.15      | <0.15      | 0.16       | 0.15       | <0.15      | 0.22       | <0.15      | <0.15      | <0.15      | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.55                | 2.62       | 2.59       | 2.42       | 2.23       | 1.96       | 2.35       | 2.26       | 1.84       | 2.16       | 2.15       | 2.50       | 2.11       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.55                | 2.30       | 2.31       | 2.22       | 2.28       | 2.27       | 2.11       | 2.38       | 2.44       | 2.27       | 2.41       | 2.83       | 2.45       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>α</sup>                         | -                           | <0.0030             | 0.0035     | 0.0036     | <0.0030    | 0.0046     | <0.0030    | <0.0030    | 0.0035     | 0.0057     | 0.0063     | 0.0074     | 0.0045     | 0.0101     |
|                        | Phenols                            | mg/L    | 0.004 <sup>α</sup>                         | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10               | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 9.45                | 11.6       | 14.4       | 13.5       | 12.9       | 11.7       | 12.7       | 13.0       | 13.0       | 12.1       | 11.9       | 11.6       | 11.5       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 4.96                | 7.03       | 7.99       | 6.90       | 7.08       | 60.7       | 16.4       | 10.7       | 10.7       | 10.5       | 10.3       | 10.1       | 10.7       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.966                       | 0.0116              | 0.107      | 0.143      | 0.154      | 0.141      | 0.0407     | 0.148      | 0.181      | 0.196      | 0.166      | 0.144      | 0.113      | 0.107      |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>α</sup>                         | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.0134              | 0.0140     | 0.0145     | 0.0144     | 0.0151     | 0.0179     | 0.0159     | 0.0155     | 0.0159     | 0.0157     | 0.0152     | 0.0143     | 0.0149     |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 24.8                | 24.7       | 22.2       | 21.1       | 21.6       | 36.7       | 24.7       | 22.7       | 22.6       | 22.5       | 22.6       | 21.6       | 21.4       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>α</sup>                        | 0.004                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00017    | <0.00010   | <0.00010   | <0.00010   | 0.00011    | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00085             | 0.00102    | 0.00123    | 0.00115    | 0.00121    | 0.00086    | 0.00117    | 0.00124    | 0.00130    | 0.00130    | 0.00112    | 0.00107    | 0.00107    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.874                       | <0.030              | 0.084      | 0.127      | 0.118      | 0.132      | 0.050      | 0.133      | 0.178      | 0.200      | 0.191      | 0.132      | 0.104      | 0.097      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050           | 0.000084   | 0.000130   | 0.000121   | 0.000147   | <0.000050  | 0.000130   | 0.000172   | 0.000195   | 0.000190   | 0.000120   | 0.000087   | 0.000077   |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 13.9                | 13.4       | 12.5       | 12.4       | 12.4       | 27.8       | 15.2       | 13.1       | 13.5       | 13.4       | 13.2       | 13.2       | 13.0       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.000498            | 0.00133    | 0.00202    | 0.00169    | 0.00180    | 0.00182    | 0.00197    | 0.00232    | 0.00266    | 0.00275    | 0.00204    | 0.00266    | 0.00246    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000313            | 0.000447   | 0.000544   | 0.000508   | 0.000470   | 0.000408   | 0.000485   | 0.000625   | 0.000636   | 0.000607   | 0.000595   | 0.000581   | 0.000584   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050            | <0.00050   | <0.00050   | <0.00050   | 0.00052    | <0.00050   | 0.00051    | 0.00060    | 0.00063    | 0.00075    | 0.00068    | 0.00074    | 0.00072    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 1.30                | 1.44       | 1.61       | 1.51       | 1.49       | 1.69       | 1.53       | 1.53       | 1.59       | 1.53       | 1.51       | 1.45       | 1.46       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.88                | 0.94       | 1.03       | 0.98       | 0.98       | 1.09       | 1.07       | 1.22       | 1.08       | 1.07       | 1.03       | 0.96       | 0.91       |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 4.77                | 5.77       | 6.95       | 5.87       | 5.74       | 3.39       | 5.46       | 5.63       | 5.77       | 5.41       | 5.38       | 5.15       | 5.10       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0228              | 0.0259     | 0.0270     | 0.0246     | 0.0241     | 0.0373     | 0.0261     | 0.0259     | 0.0263     | 0.0244     | 0.0248     | 0.0228     | 0.0234     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | 0.010      | 0.012      | 0.011      | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00673             | 0.00720    | 0.00776    | 0.00654    | 0.00645    | 0.00483    | 0.00614    | 0.00631    | 0.00615    | 0.00576    | 0.00562    | 0.00532    | 0.00511    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>α</sup>                         | 0.006                       | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0494     | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to the Mary River system.



**Table C.59: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between Mary River Mine-Exposed and Reference (GO-09) Stations in 2020**

| Variable                           | Spring |       |       |       |       |       |       |       |       |       | Summer |       |       |       |       |       |       |       |       |       |
|------------------------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                    | G0-03  | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 | G0-03  | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 |
| Conductivity (lab)                 | 0.8    | 0.7   | 1.8   | 1.3   | 0.7   | 0.7   | 0.7   | 0.8   | 1.2   | 0.9   | 0.9    | 0.9   | 1.9   | 0.9   | 1.0   | 1.0   | 1.0   | 1.0   | 0.9   | 0.9   |
| Hardness (as CaCO <sub>3</sub> )   | 0.7    | 0.7   | 1.8   | 1.3   | 0.8   | 0.7   | 0.7   | 0.7   | 1.2   | 0.9   | 0.9    | 0.9   | 2.0   | 1.0   | 0.9   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   |
| Total Suspended Solids (TSS)       | 9.3    | 5.3   | 4.9   | 4.5   | 4.2   | 4.4   | 3.9   | 3.2   | 3.7   | 4.7   | 1.1    | 0.5   | 0.2   | 0.7   | 0.9   | 1.3   | 1.1   | 0.7   | 1.4   | 1.5   |
| Total Dissolved Solids (TDS)       | 1.2    | 0.8   | 1.4   | 1.3   | 1.0   | 1.1   | 1.0   | 1.0   | 1.2   | 1.2   | 1.0    | 1.1   | 2.0   | 1.2   | 1.2   | 1.3   | 1.2   | 1.1   | 1.1   | 1.1   |
| Turbidity                          | 1.8    | 1.6   | 0.5   | 1.0   | 1.6   | 1.7   | 1.6   | 1.8   | 1.7   | 2.4   | 1.7    | 0.9   | 0.0   | 1.2   | 1.5   | 1.6   | 1.5   | 0.8   | 1.3   | 1.3   |
| Alkalinity (as CaCO <sub>3</sub> ) | 0.8    | 0.7   | 1.3   | 1.6   | 0.7   | 0.7   | 0.7   | 0.6   | 1.0   | 0.8   | 0.9    | 1.1   | 1.5   | 1.1   | 1.1   | 1.0   | 1.0   | 1.1   | 1.0   | 1.0   |
| Total Ammonia                      | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.0   | 1.0   |
| Nitrate                            | 1.9    | 1.0   | 9.0   | 4.8   | 1.5   | 1.1   | 1.0   | 7.9   | 3.0   | 2.0   | 0.8    | 0.5   | 4.9   | 0.7   | 0.9   | 0.9   | 1.1   | 1.1   | 1.2   | 1.2   |
| Nitrite                            | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Total Kjeldahl Nitrogen (TKN)      | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 2.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Dissolved Organic Carbon           | 1.3    | 1.4   | 1.3   | 1.6   | 1.3   | 1.3   | 1.3   | 1.3   | 1.4   | 1.3   | 1.1    | 0.9   | 0.4   | 1.0   | 1.0   | 0.5   | 0.6   | 0.5   | 0.6   | 0.7   |
| Total Organic Carbon               | 1.2    | 1.2   | 1.3   | 1.2   | 1.3   | 1.3   | 1.4   | 1.4   | 1.5   | 1.4   | 0.9    | 1.0   | 0.9   | 1.1   | 1.1   | 1.1   | 1.1   | 1.0   | 1.1   | 1.2   |
| Total Phosphorus                   | 5.0    | 4.2   | 3.1   | 5.6   | 2.2   | 5.6   | 2.4   | 1.6   | 5.5   | 2.0   | 1.5    | 0.6   | 0.1   | 0.8   | 1.2   | 1.3   | 1.2   | 0.9   | 1.1   | 1.1   |
| Phenols                            | 0.7    | 0.7   | 0.7   | 0.7   | 1.1   | 0.8   | 0.7   | 0.9   | 0.7   | 0.7   | 0.9    | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Bromide (Br)                       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Chloride (Cl)                      | 2.0    | 1.0   | 1.3   | 1.2   | 1.0   | 0.9   | 0.9   | 1.0   | 1.7   | 1.3   | 0.9    | 0.8   | 1.5   | 0.9   | 0.9   | 0.9   | 0.8   | 0.8   | 0.8   | 0.8   |
| Sulphate (SO <sub>4</sub> )        | 0.9    | 0.8   | 17    | 9.8   | 2.9   | 2.3   | 2.0   | 3.5   | 5.0   | 2.9   | 0.9    | 0.9   | 6.5   | 1.1   | 1.2   | 1.3   | 1.2   | 1.1   | 1.1   | 1.1   |
| Aluminum (Al)                      | 2.0    | 1.8   | 1.4   | 1.9   | 1.6   | 1.8   | 1.8   | 1.7   | 1.3   | 2.0   | 1.7    | 0.8   | 0.0   | 1.1   | 1.4   | 1.5   | 0.0   | 0.8   | 1.2   | 1.5   |
| Antimony (Sb)                      | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Arsenic (As)                       | 1.2    | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 1.4    | 0.9   | 0.5   | 1.0   | 1.3   | 1.3   | 0.5   | 0.9   | 1.2   | 1.1   |
| Barium (Ba)                        | 1.2    | 1.0   | 1.1   | 1.1   | 1.0   | 1.0   | 0.9   | 0.9   | 1.1   | 1.1   | 1.3    | 0.9   | 1.0   | 1.0   | 1.2   | 1.2   | 0.6   | 0.9   | 1.1   | 0.9   |
| Boron (B)                          | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Cadmium (Cd)                       | 0.4    | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | 0.9    | 0.9   | 0.9   | 0.9   | 2.2   | 1.8   | 0.9   | 1.0   | 0.9   | 1.1   |
| Calcium (Ca)                       | 0.9    | 0.7   | 1.5   | 1.1   | 0.7   | 0.6   | 0.6   | 0.6   | 1.1   | 0.8   | 0.9    | 0.9   | 1.8   | 0.9   | 1.0   | 1.0   | 1.0   | 0.9   | 1.0   | 1.0   |
| Chromium (Cr)                      | 1.3    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.8    | 0.8   | 0.3   | 1.1   | 1.5   | 1.6   | 0.3   | 0.7   | 1.4   | 0.7   |
| Cobalt (Co)                        | 2.2    | 1.1   | 1.6   | 1.3   | 1.1   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.8    | 0.8   | 0.2   | 1.0   | 1.5   | 1.6   | 0.2   | 0.7   | 1.4   | 0.8   |
| Copper (Cu)                        | 0.4    | 0.3   | 0.2   | 0.2   | 0.3   | 0.3   | 0.3   | 0.3   | 0.4   | 0.2   | 1.5    | 0.9   | 0.5   | 1.1   | 1.4   | 1.5   | 0.5   | 0.9   | 1.2   | 1.0   |
| Iron (Fe)                          | 3.5    | 1.9   | 1.9   | 2.2   | 1.8   | 1.7   | 1.9   | 1.7   | 1.7   | 1.8   | 1.8    | 0.8   | 0.0   | 1.1   | 1.5   | 1.5   | 0.0   | 0.7   | 1.4   | 0.8   |
| Lead (Pb)                          | 1.9    | 1.0   | 0.9   | 0.8   | 0.9   | 0.9   | 0.9   | 0.9   | 1.0   | 0.7   | 1.7    | 0.7   | 0.1   | 1.0   | 1.4   | 1.6   | 0.1   | 0.7   | 1.3   | 1.1   |
| Lithium (Li)                       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.6    | 0.8   | 1.3   | 1.0   | 1.4   | 1.4   | 0.5   | 0.8   | 1.4   | 0.9   |
| Magnesium (Mg)                     | 0.8    | 0.7   | 2.0   | 1.4   | 0.8   | 0.7   | 0.8   | 0.7   | 1.2   | 1.0   | 1.0    | 1.0   | 2.4   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Manganese (Mn)                     | 3.7    | 2.0   | 3.6   | 2.6   | 1.9   | 1.6   | 1.6   | 1.6   | 2.7   | 1.6   | 1.7    | 0.8   | 0.1   | 1.0   | 1.5   | 1.6   | 0.0   | 0.8   | 1.5   | 1.1   |
| Mercury (Hg)                       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Molybdenum (Mo)                    | 0.7    | 0.7   | 1.4   | 1.2   | 0.7   | 1.0   | 1.0   | 1.1   | 2.5   | 1.3   | 0.9    | 0.8   | 1.1   | 0.9   | 1.3   | 1.4   | 1.5   | 1.1   | 1.1   | 0.6   |
| Nickel (Ni)                        | 0.4    | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | 0.3   | 0.4   | 0.4   | 1.8    | 1.1   | 0.4   | 1.2   | 1.6   | 1.9   | 0.4   | 0.9   | 1.5   | 1.0   |
| Potassium (K)                      | 0.9    | 0.8   | 1.1   | 1.0   | 0.8   | 0.8   | 0.8   | 0.8   | 1.1   | 1.0   | 1.1    | 1.0   | 1.1   | 1.0   | 1.1   | 1.1   | 0.8   | 0.9   | 1.0   | 0.9   |
| Selenium (Se)                      | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.4   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Silicon (Si)                       | 1.1    | 1.1   | 0.9   | 1.2   | 1.0   | 1.2   | 1.1   | 1.1   | 0.9   | 1.3   | 1.6    | 0.8   | 0.4   | 1.0   | 1.4   | 1.3   | 0.3   | 0.8   | 1.6   | 0.8   |
| Silver (Ag)                        | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Sodium (Na)                        | 0.7    | 0.8   | 0.5   | 0.6   | 0.7   | 0.7   | 0.7   | 0.7   | 1.0   | 0.9   | 0.9    | 0.9   | 0.7   | 0.8   | 0.9   | 0.8   | 0.8   | 0.8   | 0.8   | 0.9   |
| Strontium (Sr)                     | 0.9    | 0.8   | 1.8   | 1.4   | 0.8   | 0.8   | 0.8   | 0.7   | 1.0   | 0.9   | 0.9    | 0.8   | 1.9   | 0.9   | 0.9   | 1.0   | 0.8   | 0.8   | 1.0   | 0.9   |
| Thallium (Tl)                      | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.7    | 0.9   | 0.4   | 1.0   | 1.3   | 1.5   | 0.4   | 0.8   | 1.4   | 1.0   |
| Tin (Sn)                           | 0.2    | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Titanium (Ti)                      | 1.7    | 1.2   | 1.1   | 1.4   | 1.0   | 1.1   | 1.1   | 1.0   | 1.0   | 1.0   | 1.7    | 0.8   | 0.0   | 1.1   | 1.4   | 1.5   | 0.0   | 0.8   | 1.2   | 1.5   |
| Uranium (U)                        | 0.9    | 0.7   | 0.9   | 0.9   | 0.7   | 0.6   | 0.6   | 0.6   | 1.2   | 0.6   | 0.8    | 0.7   | 0.7   | 0.7   | 0.8   | 0.8   | 0.6   | 0.6   | 0.7   | 0.7   |
| Vanadium (V)                       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.7    | 0.9   | 0.3   | 1.1   | 1.4   | 1.5   | 0.3   | 0.7   | 1.3   | 0.8   |
| Zinc (Zn)                          | 0.2    | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.2   | 0.3   | 0.2   | 0.5    | 0.3   | 0.3   | 0.3   | 0.7   | 0.5   | 0.3   | 0.3   | 0.4   | 0.3   |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration ≥ 10 times higher than respective mean reference or baseline period value).

**Table C.59: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Data Provided) Between Mary River Mine-Exposed and Reference (GO-09) Stations in 2020**

| Variable                           | Fall  |       |       |       |       |       |       |       |       |       |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                    | G0-03 | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 |
| Conductivity (lab)                 | 0.9   | 0.9   | 1.6   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 0.9   | 0.9   |
| Hardness (as CaCO <sub>3</sub> )   | 0.9   | 0.9   | 1.8   | 1.1   | 1.0   | 1.0   | 1.0   | 0.9   | 0.9   | 0.9   |
| Total Suspended Solids (TSS)       | 1.7   | 0.9   | 0.9   | 0.9   | 1.5   | 0.9   | 1.3   | 0.9   | 0.9   | 0.9   |
| Total Dissolved Solids (TDS)       | 0.9   | 1.0   | 1.7   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 0.9   | 1.0   |
| Turbidity                          | 1.5   | 1.9   | 0.2   | 1.7   | 2.2   | 2.5   | 2.5   | 1.5   | 1.1   | 1.0   |
| Alkalinity (as CaCO <sub>3</sub> ) | 0.9   | 0.9   | 1.3   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Total Ammonia                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.2   | 1.0   |
| Nitrate                            | 1.6   | 1.6   | 11    | 3.1   | 2.2   | 2.2   | 2.4   | 2.3   | 2.1   | 2.2   |
| Nitrite                            | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Total Kjeldahl Nitrogen (TKN)      | 1.0   | 1.0   | 1.1   | 1.0   | 1.0   | 1.5   | 1.0   | 1.0   | 1.0   | 1.0   |
| Dissolved Organic Carbon           | 0.9   | 0.9   | 0.8   | 0.9   | 0.9   | 0.7   | 0.8   | 0.8   | 1.0   | 0.8   |
| Total Organic Carbon               | 0.9   | 1.0   | 1.0   | 0.9   | 1.0   | 1.0   | 1.0   | 1.0   | 1.2   | 1.0   |
| Total Phosphorus                   | 0.9   | 1.4   | 0.9   | 0.9   | 1.0   | 1.7   | 1.9   | 2.2   | 1.3   | 3.0   |
| Phenols                            | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Bromide (Br)                       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Chloride (Cl)                      | 1.1   | 1.1   | 1.0   | 1.1   | 1.1   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   |
| Sulphate (SO <sub>4</sub> )        | 1.0   | 1.1   | 9.1   | 2.5   | 1.6   | 1.6   | 1.6   | 1.5   | 1.5   | 1.6   |
| Aluminum (Al)                      | 1.8   | 1.6   | 0.5   | 1.7   | 2.1   | 2.2   | 1.9   | 1.7   | 1.3   | 1.2   |
| Antimony (Sb)                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Arsenic (As)                       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Barium (Ba)                        | 1.0   | 1.1   | 1.3   | 1.1   | 1.1   | 1.1   | 1.1   | 1.1   | 1.0   | 1.1   |
| Boron (B)                          | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Cadmium (Cd)                       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Calcium (Ca)                       | 0.9   | 0.9   | 1.5   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Chromium (Cr)                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Cobalt (Co)                        | 1.0   | 1.0   | 1.7   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.0   | 1.0   |
| Copper (Cu)                        | 1.1   | 1.2   | 0.8   | 1.1   | 1.2   | 1.3   | 1.3   | 1.1   | 1.0   | 1.0   |
| Iron (Fe)                          | 1.5   | 1.6   | 0.6   | 1.7   | 2.2   | 2.5   | 2.4   | 1.6   | 1.3   | 1.2   |
| Lead (Pb)                          | 1.4   | 1.7   | 0.6   | 1.5   | 2.0   | 2.2   | 2.2   | 1.4   | 1.0   | 0.9   |
| Lithium (Li)                       | 1.0   | 1.0   | 1.8   | 1.2   | 1.1   | 1.1   | 1.1   | 1.0   | 1.0   | 1.0   |
| Magnesium (Mg)                     | 0.9   | 0.9   | 2.1   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Manganese (Mn)                     | 1.3   | 1.4   | 1.4   | 1.5   | 1.8   | 2.1   | 2.1   | 1.6   | 2.1   | 1.9   |
| Mercury (Hg)                       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Molybdenum (Mo)                    | 1.2   | 1.1   | 0.9   | 1.1   | 1.4   | 1.5   | 1.4   | 1.4   | 1.3   | 1.3   |
| Nickel (Ni)                        | 1.0   | 1.0   | 1.0   | 1.0   | 1.2   | 1.3   | 1.5   | 1.4   | 1.5   | 1.4   |
| Potassium (K)                      | 1.0   | 1.0   | 1.2   | 1.1   | 1.1   | 1.1   | 1.1   | 1.0   | 1.0   | 1.0   |
| Selenium (Se)                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Silicon (Si)                       | 1.0   | 1.0   | 1.1   | 1.1   | 1.3   | 1.1   | 1.1   | 1.1   | 1.0   | 1.0   |
| Silver (Ag)                        | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Sodium (Na)                        | 1.0   | 1.0   | 0.6   | 0.9   | 1.0   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   |
| Strontium (Sr)                     | 1.0   | 1.0   | 1.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 0.9   | 0.9   |
| Thallium (Tl)                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Tin (Sn)                           | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Titanium (Ti)                      | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.2   | 1.1   | 1.0   | 1.0   | 1.0   |
| Uranium (U)                        | 0.9   | 0.9   | 0.7   | 0.8   | 0.9   | 0.9   | 0.8   | 0.8   | 0.7   | 0.7   |
| Vanadium (V)                       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Zinc (Zn)                          | 1.0   | 1.0   | 1.0   | 1.0   | 16    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration ≥ 10 times higher than respective mean reference or baseline period value).

Table C.60: Dissolved Metal Concentrations at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Spring Sampling Event |            |            |            |            |            |            |            |            |            |            |            |            | Summer Sampling Event |            |            |            |            |            |           |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----------------------|------------|------------|------------|------------|------------|-----------|
|                  |                 |       | G0-09-A               | G0-09      | G0-09-B    | G0-03      | G0-01      | F0-01      | E0-10      | E0-03      | E0-21      | E0-20      | C0-10      | C0-05      | C0-01      | G0-09-A               | G0-09      | G0-09-B    | G0-03      | G0-01      | F0-01      |           |
|                  |                 |       | 04-Jul-20             | 04-Jul-20  | 04-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20  | 03-Jul-20             | 03-Aug-20  | 02-Aug-20  | 02-Aug-20  | 02-Aug-20  | 01-Aug-20  | 01-Aug-20 |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0112                | 0.0172     | 0.0825     | 0.0512     | 0.0517     | 0.0099     | 0.0273     | 0.0440     | 0.0528     | 0.0456     | 0.0426     | 0.0282     | 0.0412     | 0.0291                | 0.0305     | 0.0271     | 0.0592     | 0.0325     | 0.0067     |           |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |           |
|                  | Arsenic (As)    | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |           |
|                  | Barium (Ba)     | mg/L  | 0.00416               | 0.00366    | 0.00320    | 0.00334    | 0.00325    | 0.00405    | 0.00378    | 0.00314    | 0.00311    | 0.00316    | 0.00315    | 0.00418    | 0.00358    | 0.0117                | 0.0108     | 0.0105     | 0.0107     | 0.0105     | 0.0168     |           |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |           |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |           |
|                  | Boron (B)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |           |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |           |
|                  | Calcium (Ca)    | mg/L  | 6.75                  | 6.76       | 3.86       | 4.26       | 3.98       | 9.23       | 6.55       | 4.11       | 3.92       | 3.98       | 3.90       | 6.22       | 4.69       | 17.3                  | 17.6       | 15.6       | 15.2       | 15.6       | 30.8       |           |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |           |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |           |
|                  | Copper (Cu)     | mg/L  | <0.00050              | <0.00050   | 0.00051    | 0.00053    | 0.00058    | <0.00050   | <0.00050   | <0.00050   | 0.00051    | 0.00054    | <0.00050   | 0.00057    | 0.00063    | 0.00110               | 0.00099    | 0.00093    | 0.00090    | 0.00097    | 0.00100    |           |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030     | 0.039      | 0.030      | 0.031      | <0.030     | <0.030     | <0.030     | <0.030     | 0.032      | 0.031      | <0.030     | 0.031      | 0.015                 | 0.013      | 0.011      | 0.034      | 0.013      | <0.010     |           |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000056   | <0.000050  | 0.000055   | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |           |
|                  | Lithium (Li)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0017                | 0.0016     | 0.0017     | 0.0016     | 0.0016     | 0.0032     |           |
|                  | Magnesium (Mg)  | mg/L  | 3.80                  | 3.59       | 2.29       | 2.45       | 2.27       | 6.51       | 4.60       | 2.56       | 2.41       | 2.49       | 2.32       | 4.05       | 2.89       | 9.99                  | 9.54       | 8.94       | 8.51       | 8.86       | 21.6       |           |
|                  | Manganese (Mn)  | mg/L  | 0.000352              | 0.000291   | 0.000908   | 0.000994   | 0.00121    | 0.00240    | 0.00169    | 0.000980   | 0.000957   | 0.00123    | 0.00135    | 0.00315    | 0.00227    | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |           |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |           |
|                  | Molybdenum (Mo) | mg/L  | 0.000078              | 0.000074   | 0.000092   | 0.000077   | 0.000077   | 0.000111   | 0.000102   | 0.000089   | 0.000103   | 0.000101   | 0.000104   | 0.000265   | 0.000161   | 0.000562              | 0.000503   | 0.000563   | 0.000487   | 0.000467   | 0.000561   |           |
|                  | Nickel (Ni)     | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | 0.00054    |           |
|                  | Potassium (K)   | mg/L  | 0.49                  | 0.46       | 0.44       | 0.44       | 0.46       | 0.57       | 0.52       | 0.43       | 0.43       | 0.43       | 0.40       | 0.63       | 0.50       | 1.43                  | 1.32       | 1.39       | 1.28       | 1.36       | 1.83       |           |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.000082   |           |
|                  | Silicon (Si)    | mg/L  | 0.57                  | 0.52       | 0.57       | 0.52       | 0.49       | 0.42       | 0.45       | 0.47       | 0.48       | 0.45       | 0.46       | 0.45       | 0.43       | 0.820                 | 0.906      | 0.747      | 0.741      | 0.809      | 1.10       |           |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |           |
|                  | Sodium (Na)     | mg/L  | 0.735                 | 0.688      | 0.698      | 0.587      | 0.679      | 0.433      | 0.555      | 0.573      | 0.570      | 0.576      | 0.577      | 0.874      | 0.712      | 5.40                  | 4.70       | 5.12       | 4.24       | 4.22       | 3.32       |           |
|                  | Strontium (Sr)  | mg/L  | 0.00571               | 0.00518    | 0.00433    | 0.00425    | 0.00402    | 0.00971    | 0.00717    | 0.00437    | 0.00419    | 0.00401    | 0.00384    | 0.00528    | 0.00444    | 0.0220                | 0.0209     | 0.0216     | 0.0194     | 0.0183     | 0.0430     |           |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | 0.000010   |           |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |           |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | 0.00092               | 0.00087    | 0.00073    | 0.00227    | 0.00086    | <0.00030   |           |
|                  | Uranium (U)     | mg/L  | 0.000441              | 0.000345   | 0.000234   | 0.000224   | 0.000193   | 0.000309   | 0.000268   | 0.000193   | 0.000184   | 0.000184   | 0.000179   | 0.000381   | 0.000237   | 0.00533               | 0.00485    | 0.00491    | 0.00367    | 0.00381    | 0.00373    |           |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |           |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | 0.0035     | 0.0021                | <0.0010    | 0.0098     | <0.0010    | 0.0018     | <0.0010    |           |

Table C.60: Dissolved Metal Concentrations at Mary River Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units    | Summer Sampling Event |            |            |            |            |            |            | Fall Sampling Event |            |            |            |            |            |            |            |            |            |            |            |            |
|------------------|-----------------|----------|-----------------------|------------|------------|------------|------------|------------|------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                  |                 |          | E0-10                 | E0-03      | E0-21      | E0-20      | C0-10      | C0-05      | C0-01      | G0-09-A             | G0-09      | G0-09-B    | G0-03      | GO-01      | FO-01      | EO-10      | EO-03      | EO-21      | EO-20      | C0-10      | C0-05      | CO-01      |
|                  |                 |          | 01-Aug-20             | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 31-Jul-20  | 31-Jul-20  | 31-Jul-20  | 28-Aug-20           | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L     | 0.0276                | 0.0265     | 0.0247     | 0.720      | 0.0199     | 0.106      | 0.0308     | 0.0064              | 0.0112     | 0.0194     | 0.0199     | 0.0154     | 0.0055     | 0.0141     | 0.0223     | 0.0198     | 0.0091     | 0.0137     | 0.0650     | 0.0519     |
|                  | Antimony (Sb)   | mg/L     | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L     | <0.00010              | <0.00010   | <0.00010   | 0.00024    | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L     | 0.0105                | 0.0107     | 0.0109     | 0.0164     | 0.0106     | 0.0107     | 0.0106     | 0.0135              | 0.0137     | 0.0141     | 0.0137     | 0.0140     | 0.0176     | 0.0148     | 0.0146     | 0.0147     | 0.0145     | 0.0140     | 0.0145     | 0.0140     |
|                  | Beryllium (Be)  | mg/L     | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L     | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L     | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L     | <0.0000050            | <0.0000050 | <0.0000050 | 0.0000081  | <0.0000050 | <0.0000050 | <0.0000050 | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L     | 16.6                  | 15.8       | 16.1       | 15.5       | 15.4       | 15.4       | 15.9       | 26.4                | 25.8       | 22.2       | 21.0       | 22.2       | 37.3       | 24.5       | 22.8       | 22.8       | 22.6       | 22.5       | 22.2       | 21.8       |
|                  | Chromium (Cr)   | mg/L     | <0.00050              | <0.00050   | <0.00050   | 0.00173    | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L     | <0.00010              | <0.00010   | <0.00010   | 0.00045    | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00015    | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L     | 0.00094               | 0.00090    | 0.00089    | 0.00231    | 0.00098    | 0.00115    | 0.00100    | 0.00102             | 0.00096    | 0.00108    | 0.00137    | 0.00106    | 0.00136    | 0.00099    | 0.00101    | 0.00105    | 0.00098    | 0.00098    | 0.00106    | 0.00100    |
|                  | Iron (Fe)       | mg/L     | 0.013                 | 0.013      | 0.012      | 1.03       | 0.011      | 0.084      | 0.020      | <0.030              | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L     | <0.000050             | <0.000050  | <0.000050  | 0.000921   | <0.000050  | 0.000108   | <0.000050  | <0.000050           | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L     | 0.0015                | 0.0012     | 0.0012     | 0.0023     | 0.0010     | 0.0014     | <0.0010    | 0.0010              | 0.0011     | 0.0011     | <0.0010    | 0.0011     | 0.0022     | 0.0012     | 0.0010     | 0.0011     | 0.0011     | 0.0010     | <0.0010    | <0.0010    |
|                  | Magnesium (Mg)  | mg/L     | 8.97                  | 9.09       | 8.99       | 9.16       | 8.86       | 8.92       | 8.72       | 14.6                | 14.1       | 13.4       | 12.6       | 12.7       | 28.5       | 15.9       | 13.9       | 13.8       | 13.9       | 13.5       | 14.1       | 13.6       |
|                  | Manganese (Mn)  | mg/L     | <0.00050              | <0.00050   | <0.00050   | 0.0127     | <0.00050   | 0.00201    | 0.00230    | 0.000404            | 0.000268   | 0.000309   | 0.000265   | 0.000222   | 0.000634   | 0.000307   | 0.000356   | 0.000374   | 0.000477   | 0.000580   | 0.00189    | 0.00104    |
|                  | Mercury (Hg)    | mg/L     | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L     | 0.000486              | 0.000720   | 0.000781   | 0.000421   | 0.000617   | 0.000583   | 0.000585   | 0.000313            | 0.000481   | 0.000570   | 0.000504   | 0.000532   | 0.000415   | 0.000520   | 0.000664   | 0.000689   | 0.000673   | 0.000648   | 0.000616   | 0.000595   |
|                  | Nickel (Ni)     | mg/L     | <0.00050              | <0.00050   | <0.00050   | 0.00177    | <0.00050   | 0.00088    | 0.00056    | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | 0.00054    | 0.00052    | 0.00067    | 0.00065    |
|                  | Potassium (K)   | mg/L     | 1.28                  | 1.30       | 1.28       | 1.56       | 1.26       | 1.29       | 1.26       | 1.36                | 1.49       | 1.61       | 1.48       | 1.49       | 1.69       | 1.53       | 1.54       | 1.55       | 1.50       | 1.48       | 1.52       | 1.44       |
|                  | Selenium (Se)   | mg/L     | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L     | 0.797                 | 0.834      | 0.756      | 2.02       | 0.941      | 1.17       | 0.912      | 0.92                | 0.79       | 0.85       | 0.79       | 0.79       | 1.07       | 0.84       | 0.79       | 0.81       | 0.81       | 0.80       | 0.80       | 0.76       |
|                  | Silver (Ag)     | mg/L     | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L     | 4.05                  | 3.94       | 3.89       | 3.77       | 3.93       | 4.00       | 3.96       | 5.27                | 6.22       | 7.28       | 6.06       | 5.99       | 3.59       | 5.65       | 6.02       | 5.93       | 5.66       | 5.64       | 5.76       | 5.45       |
|                  | Strontium (Sr)  | mg/L     | 0.0198                | 0.0198     | 0.0202     | 0.0197     | 0.0194     | 0.0188     | 0.0193     | 0.0241              | 0.0251     | 0.0275     | 0.0240     | 0.0240     | 0.0363     | 0.0275     | 0.0257     | 0.0261     | 0.0247     | 0.0247     | 0.0229     | 0.0236     |
|                  | Thallium (Tl)   | mg/L     | <0.000010             | <0.000010  | <0.000010  | 0.000029   | <0.000010  | 0.000011   | <0.000010  | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L     | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
| Titanium (Ti)    | mg/L            | 0.00076  | 0.00076               | 0.00081    | 0.0571     | 0.00058    | 0.00463    | 0.00107    | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |            |
| Uranium (U)      | mg/L            | 0.00390  | 0.00373               | 0.00368    | 0.00370    | 0.00336    | 0.00331    | 0.00342    | 0.00662    | 0.00712             | 0.00761    | 0.00649    | 0.00625    | 0.00469    | 0.00590    | 0.00615    | 0.00604    | 0.00563    | 0.00558    | 0.00539    | 0.00514    |            |
| Vanadium (V)     | mg/L            | <0.00050 | <0.00050              | <0.00050   | 0.00192    | <0.00050   | <0.00050   | <0.00050   | <0.0010    | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |            |
| Zinc (Zn)        | mg/L            | <0.0010  | <0.0010               | <0.0010    | 0.0030     | <0.0010    | 0.0036     | <0.0010    | <0.0030    | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |            |

Table C.61: Summary of the Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Mary River Mine-Exposed and Reference (GO-09) Stations in 2020

| Variable        | Spring |       |       |       |       |       |       |       |       |       | Summer |       |       |       |       |       |       |       |       |       | Fall  |       |       |       |       |       |       |       |       |       |
|-----------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                 | G0-03  | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 | G0-03  | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 | G0-03 | G0-01 | FO-01 | E0-10 | E0-03 | E0-21 | E0-20 | C0-10 | CO-05 | CO-01 |
| Aluminum (Al)   | 1.4    | 1.4   | 0.3   | 0.7   | 1.2   | 1.4   | 1.2   | 1.2   | 0.8   | 1.1   | 2.0    | 1.1   | 0.2   | 1.0   | 0.9   | 0.9   | 25    | 0.7   | 3.7   | 1.1   | 1.6   | 1.2   | 0.4   | 1.1   | 1.8   | 1.6   | 0.7   | 1.1   | 5.3   | 4.2   |
| Antimony (Sb)   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Arsenic (As)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 2.4   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Barium (Ba)     | 0.9    | 0.9   | 1.1   | 1.0   | 0.9   | 0.8   | 0.9   | 0.9   | 1.1   | 1.0   | 1.0    | 1.0   | 1.5   | 1.0   | 1.0   | 1.0   | 1.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.3   | 1.1   | 1.1   | 1.1   | 1.1   | 1.0   | 1.1   | 1.0   |
| Beryllium (Be)  | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Bismuth (Bi)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Boron (B)       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Cadmium (Cd)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.6   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Calcium (Ca)    | 0.7    | 0.7   | 1.6   | 1.1   | 0.7   | 0.7   | 0.7   | 0.7   | 1.1   | 0.8   | 0.9    | 0.9   | 1.8   | 1.0   | 0.9   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.8   | 0.9   | 1.5   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Chromium (Cr)   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 3.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Cobalt (Co)     | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 4.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Copper (Cu)     | 1.1    | 1.2   | 1.0   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.1   | 1.3   | 0.9    | 1.0   | 1.0   | 0.9   | 0.9   | 0.9   | 2.3   | 1.0   | 1.1   | 1.0   | 1.3   | 1.0   | 1.3   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Iron (Fe)       | 0.9    | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 1.0   | 0.9   | 0.9   | 0.9   | 2.6    | 1.0   | 0.8   | 1.0   | 1.0   | 0.9   | 79    | 0.8   | 6.5   | 1.5   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Lead (Pb)       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.1   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 18    | 1.0   | 2.2   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Lithium (Li)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.9   | 0.9   | 0.7   | 0.7   | 1.4   | 0.6   | 0.8   | 0.6   | 0.9   | 1.0   | 2.1   | 1.1   | 0.9   | 1.0   | 1.0   | 0.9   | 0.9   | 0.9   |
| Magnesium (Mg)  | 0.8    | 0.7   | 2.0   | 1.4   | 0.8   | 0.7   | 0.8   | 0.7   | 1.3   | 0.9   | 0.9    | 0.9   | 2.3   | 0.9   | 1.0   | 0.9   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 2.0   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Manganese (Mn)  | 1.9    | 2.3   | 4.6   | 3.3   | 1.9   | 1.9   | 2.4   | 2.6   | 6.1   | 4.4   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 25    | 1.0   | 4.0   | 4.6   | 0.8   | 0.7   | 1.9   | 0.9   | 1.1   | 1.1   | 1.5   | 1.8   | 5.8   | 3.2   |
| Mercury (Hg)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Molybdenum (Mo) | 0.9    | 0.9   | 1.4   | 1.3   | 1.1   | 1.3   | 1.2   | 1.3   | 3.3   | 2.0   | 0.9    | 0.9   | 1.0   | 0.9   | 1.3   | 1.4   | 0.8   | 1.1   | 1.1   | 1.1   | 1.1   | 1.2   | 0.9   | 1.1   | 1.5   | 1.5   | 1.5   | 1.4   | 1.4   | 1.3   |
| Nickel (Ni)     | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.1   | 1.0   | 1.0   | 1.0   | 3.5   | 1.0   | 1.8   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.1   | 1.0   | 1.3   | 1.3   |
| Potassium (K)   | 0.9    | 1.0   | 1.2   | 1.1   | 0.9   | 0.9   | 0.9   | 0.9   | 1.4   | 1.1   | 0.9    | 1.0   | 1.3   | 0.9   | 0.9   | 0.9   | 1.1   | 0.9   | 0.9   | 0.9   | 1.0   | 1.0   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Selenium (Se)   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.6   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Silicon (Si)    | 0.9    | 0.9   | 0.8   | 0.8   | 0.8   | 0.9   | 0.8   | 0.8   | 0.8   | 0.8   | 0.9    | 1.0   | 1.3   | 1.0   | 1.0   | 0.9   | 2.5   | 1.1   | 1.4   | 1.1   | 0.9   | 0.9   | 1.3   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Silver (Ag)     | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Sodium (Na)     | 0.8    | 1.0   | 0.6   | 0.8   | 0.8   | 0.8   | 0.8   | 0.8   | 1.2   | 1.0   | 0.8    | 0.8   | 0.7   | 0.8   | 0.8   | 0.8   | 0.7   | 0.8   | 0.8   | 0.8   | 1.0   | 1.0   | 0.6   | 0.9   | 1.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   |
| Strontium (Sr)  | 0.8    | 0.8   | 1.9   | 1.4   | 0.9   | 0.8   | 0.8   | 0.8   | 1.0   | 0.9   | 0.9    | 0.9   | 2.0   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 0.9   | 1.4   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 0.9   | 0.9   |
| Thallium (Tl)   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 2.9   | 1.0   | 1.1   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Tin (Sn)        | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Titanium (Ti)   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 2.7    | 1.0   | 0.4   | 0.9   | 0.9   | 1.0   | -     | 0.7   | 5.5   | 1.3   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Uranium (U)     | 0.7    | 0.6   | 0.9   | 0.8   | 0.6   | 0.5   | 0.5   | 0.5   | 1.1   | 0.7   | 0.7    | 0.8   | 0.7   | 0.8   | 0.7   | 0.7   | 0.7   | 0.7   | 0.7   | 0.7   | 0.9   | 0.9   | 0.7   | 0.8   | 0.9   | 0.8   | 0.8   | 0.8   | 0.8   | 0.7   |
| Vanadium (V)    | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 3.8   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |
| Zinc (Zn)       | 1.0    | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.2   | 0.2    | 0.4   | 0.2   | 0.2   | 0.2   | 0.2   | 0.7   | 0.2   | 0.8   | 0.2   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   |

Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).

Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).

Denotes highly elevated concentration (mean concentration≥ 10 times higher than respective mean reference or baseline period value).

Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.

Table C.62: In Situ Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020

| Depth<br>(m)      | Temperature (°C) |           |           |           |           |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           |           |           |           |           | Dissolved Oxygen (% Saturation) |           |           |           |           |
|-------------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------------------------------|-----------|-----------|-----------|-----------|
|                   | BLO-01-A         | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-06    | BLO-01-A                | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-06    | BLO-01-A                        | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    |
| Date<br>Collected | 19-Apr-20        | 19-Apr-20 | 19-Apr-20 | 21-Apr-20 | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | 19-Apr-20               | 19-Apr-20 | 19-Apr-20 | 21-Apr-20 | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | 19-Apr-20                       | 19-Apr-20 | 19-Apr-20 | 21-Apr-20 | 21-Apr-20 |
| 1.0               | 0.3              | 0.9       | 0.1       | 0.0       | 0.3       | 0.3       | 0.0       | 0.3       | 0.2       | 0.1       | 13.11                   | 12.93     | 13.52     | 14.67     | 14.40     | 14.77     | 14.57     | 14.63     | 14.78     | 14.95     | 90.0                            | 90.6      | 98.7      | 100.2     | 99.2      |
| 2.0               | 0.1              | 0.1       | 0.0       | 0.2       | 0.2       | 0.1       | 0.0       | 0.2       | 0.0       | 0.1       | 13.09                   | 13.32     | 13.44     | 14.58     | 14.66     | 14.93     | 15.09     | 14.55     | 14.87     | 15.02     | 90.0                            | 91.6      | 92.3      | 100.3     | 100.6     |
| 3.0               | 0.2              | 0.2       | 0.2       | 0.2       | 0.2       | 0.2       | 0.1       | 0.3       | 0.2       | 0.2       | 13.03                   | 13.24     | 13.32     | 14.58     | 14.55     | 14.86     | 14.82     | 14.40     | 14.66     | 14.81     | 90.1                            | 91.2      | 91.7      | 100.4     | 100.3     |
| 4.0               | 0.4              | 0.4       | 0.3       | 0.3       | 0.3       | 0.3       | 0.2       | 0.4       | 0.3       | 0.3       | 12.89                   | 13.20     | 13.23     | 14.48     | 14.38     | 14.82     | 14.74     | 14.25     | 14.57     | 14.68     | 89.6                            | 91.4      | 91.7      | 100.0     | 99.4      |
| 5.0               | 0.5              | 0.5       | -         | 0.4       | 0.4       | 0.3       | 0.3       | 0.4       | 0.3       | 0.3       | 12.79                   | 13.15     | -         | 14.36     | 14.21     | 14.78     | 14.65     | 14.21     | 14.53     | 14.56     | 89.0                            | 91.3      | -         | 99.3      | 98.3      |
| 6.0               | 0.7              | 0.5       | -         | 0.4       | 0.4       | 0.3       | 0.4       | 0.4       | 0.4       | 0.4       | 12.62                   | 13.11     | -         | 14.17     | 14.18     | 15.23     | 14.53     | 14.14     | 14.39     | 14.42     | 88.1                            | 91.3      | -         | 98.1      | 98.2      |
| 7.0               | 0.7              | 0.7       | -         | 0.4       | 0.4       | -         | 0.5       | 0.4       | 0.4       | 0.4       | 12.48                   | 13.01     | -         | 14.15     | 14.14     | -         | 14.37     | 14.08     | 14.32     | 14.37     | 87.4                            | 90.9      | -         | 98.0      | 98.0      |
| 8.0               | 0.8              | 0.7       | -         | 0.4       | 0.4       | -         | 0.6       | 0.4       | 0.4       | 0.4       | 12.19                   | 12.86     | -         | 14.10     | 14.08     | -         | 14.22     | 14.02     | 14.28     | 14.42     | 85.8                            | 90.1      | -         | 97.7      | 97.6      |
| 9.0               | 0.9              | 0.8       | -         | 0.5       | 0.5       | -         | 0.7       | 0.4       | 0.4       | -         | 11.79                   | 12.62     | -         | 14.01     | 14.02     | -         | 14.08     | 13.99     | 14.20     | -         | 83.3                            | 88.7      | -         | 97.2      | 97.2      |
| 10.0              | 1.0              | -         | -         | 0.5       | 0.5       | -         | 0.8       | 0.5       | 0.4       | -         | 11.33                   | -         | -         | 13.94     | 13.94     | -         | 13.86     | 13.96     | 14.15     | -         | 80.4                            | -         | -         | 96.8      | 96.8      |
| 11.0              | 1.1              | -         | -         | 0.5       | 0.5       | -         | 0.8       | 0.5       | 0.5       | -         | 10.81                   | -         | -         | 13.87     | 13.89     | -         | 13.78     | 13.95     | 14.08     | -         | 77.3                            | -         | -         | 96.3      | 96.4      |
| 12.0              | 1.3              | -         | -         | -         | 0.5       | -         | 0.9       | 0.5       | 0.5       | -         | 6.90                    | -         | -         | -         | 13.90     | -         | 13.70     | 13.92     | 13.99     | -         | 49.3                            | -         | -         | -         | 96.5      |
| 13.0              | 1.5              | -         | -         | -         | 0.5       | -         | 0.9       | 0.5       | 0.5       | -         | 5.58                    | -         | -         | -         | 13.92     | -         | 13.55     | 13.89     | 13.88     | -         | 40.6                            | -         | -         | -         | 96.6      |
| 14.0              | 1.5              | -         | -         | -         | 0.5       | -         | 1.0       | 0.5       | 0.5       | -         | 2.30                    | -         | -         | -         | 13.93     | -         | 13.42     | 13.82     | 13.74     | -         | 16.6                            | -         | -         | -         | 96.8      |
| 15.0              | 1.7              | -         | -         | -         | 0.5       | -         | 1.0       | 0.6       | 0.6       | -         | 0.93                    | -         | -         | -         | 13.88     | -         | 13.34     | 13.70     | 13.61     | -         | 6.7                             | -         | -         | -         | 96.5      |
| 16.0              | -                | -         | -         | -         | 0.6       | -         | 1.1       | 0.6       | 0.6       | -         | -                       | -         | -         | -         | 13.73     | -         | 13.20     | 13.59     | 13.50     | -         | -                               | -         | -         | -         | 95.7      |
| 17.0              | -                | -         | -         | -         | 0.6       | -         | -         | 0.6       | 0.6       | -         | -                       | -         | -         | -         | 13.54     | -         | -         | 13.50     | 13.39     | -         | -                               | -         | -         | -         | 94.4      |
| 18.0              | -                | -         | -         | -         | 0.6       | -         | -         | 0.6       | 0.6       | -         | -                       | -         | -         | -         | 13.42     | -         | -         | 13.52     | 13.29     | -         | -                               | -         | -         | -         | 93.6      |
| 19.0              | -                | -         | -         | -         | 0.6       | -         | -         | 0.7       | 0.7       | -         | -                       | -         | -         | -         | 13.35     | -         | -         | 13.48     | 13.20     | -         | -                               | -         | -         | -         | 93.0      |
| 20.0              | -                | -         | -         | -         | 0.7       | -         | -         | 0.7       | 0.7       | -         | -                       | -         | -         | -         | 13.25     | -         | -         | 13.43     | 13.07     | -         | -                               | -         | -         | -         | 92.1      |
| 21.0              | -                | -         | -         | -         | -         | -         | -         | -         | 0.7       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 13.00     | -         | -                               | -         | -         | -         | -         |
| 22.0              | -                | -         | -         | -         | -         | -         | -         | -         | 0.8       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 12.66     | -         | -                               | -         | -         | -         | -         |
| 23.0              | -                | -         | -         | -         | -         | -         | -         | -         | 0.8       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 12.52     | -         | -                               | -         | -         | -         | -         |
| 24.0              | -                | -         | -         | -         | -         | -         | -         | -         | 0.9       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 12.40     | -         | -                               | -         | -         | -         | -         |
| 25.0              | -                | -         | -         | -         | -         | -         | -         | -         | 1.0       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 12.14     | -         | -                               | -         | -         | -         | -         |
| 26.0              | -                | -         | -         | -         | -         | -         | -         | -         | 1.0       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 11.94     | -         | -                               | -         | -         | -         | -         |
| 27.0              | -                | -         | -         | -         | -         | -         | -         | -         | 1.1       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 11.35     | -         | -                               | -         | -         | -         | -         |
| 28.0              | -                | -         | -         | -         | -         | -         | -         | -         | 1.2       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 11.18     | -         | -                               | -         | -         | -         | -         |

Notes: Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.8, 9.7, 5.0, 11.5, 20.7, 7.3, 16.9, 20.0, 27.0, and 8.5 m, respectively, at the time of winter sampling. Ice thickness at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 1.32, 1.75, 1.40, 1.39, 1.43, 1.52, 1.65, 1.50, 1.33, and 1.40 m, respectively, at the time of winter sampling.



Table C.62: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Winter, Mary River Project CREMP, April 2020

| Depth<br>(m)      | Dissolved Oxygen (% Saturation) |           |           |           |           | pH (pH units) |           |           |           |           |           |           |           |           |           | Specific Conductance (µS/cm) |           |           |           |           |           |           |           |           |           |
|-------------------|---------------------------------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                   | BLO-05-B                        | BLO-03    | BLO-04    | BLO-09    | BLO-06    | BLO-01-A      | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-06    | BLO-01-A                     | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-06    |
| Date<br>Collected | 21-Apr-20                       | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | 19-Apr-20     | 19-Apr-20 | 19-Apr-20 | 21-Apr-20 | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | 19-Apr-20                    | 19-Apr-20 | 19-Apr-20 | 21-Apr-20 | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 |
| 1.0               | 102.6                           | 98.5      | 101.1     | 101.4     | 102.5     | 7.86          | 7.78      | 7.77      | 7.72      | 7.49      | 7.73      | 8.19      | 8.14      | 7.96      | 7.94      | 309.7                        | 327.7     | 316.5     | 131.7     | 131.5     | 134.4     | 139.6     | 132.1     | 131.1     | 134.6     |
| 2.0               | 102.5                           | 103.3     | 100.2     | 101.9     | 103.2     | 7.77          | 7.73      | 7.76      | 7.61      | 7.48      | 7.68      | 8.06      | 7.97      | 7.91      | 7.89      | 304.7                        | 311.2     | 311.4     | 128.6     | 129.3     | 131.2     | 136.0     | 128.2     | 130.0     | 131.8     |
| 3.0               | 102.3                           | 102.1     | 99.3      | 100.9     | 102.2     | 7.75          | 7.71      | 7.76      | 7.61      | 7.49      | 7.64      | 7.99      | 7.82      | 7.84      | 7.84      | 302.3                        | 308.5     | 309.3     | 127.7     | 127.4     | 131.0     | 132.8     | 127.0     | 128.2     | 129.6     |
| 4.0               | 102.3                           | 101.7     | 98.6      | 100.4     | 101.4     | 7.74          | 7.70      | 7.76      | 7.61      | 7.49      | 7.62      | 7.94      | 7.80      | 7.84      | 7.82      | 300.5                        | 306.4     | 306.7     | 126.6     | 128.3     | 130.5     | 131.8     | 126.2     | 128.3     | 128.7     |
| 5.0               | 102.0                           | 101.2     | 98.3      | 100.4     | 100.7     | 7.73          | 7.71      | -         | 7.60      | 7.50      | 7.60      | 7.91      | 7.78      | 7.83      | 7.86      | 299.3                        | 305.5     | -         | 125.9     | 125.6     | 130.9     | 130.4     | 125.9     | 128.1     | 127.9     |
| 6.0               | 105.2                           | 100.7     | 97.8      | 99.6      | 99.8      | 7.73          | 7.71      | -         | 7.59      | 7.50      | 7.57      | 7.89      | 7.76      | 7.81      | 7.79      | 298.4                        | 304.3     | -         | 125.3     | 125.4     | 135.9     | 129.2     | 125.4     | 127.0     | 127.0     |
| 7.0               | -                               | 99.9      | 97.5      | 99.1      | 99.4      | 7.72          | 7.71      | -         | 7.59      | 7.49      | -         | 7.87      | 7.76      | 7.81      | 7.78      | 297.8                        | 303.6     | -         | 125.0     | 124.9     | -         | 127.7     | 120.0     | 126.6     | 127.9     |
| 8.0               | -                               | 99.0      | 97.1      | 98.9      | 99.7      | 7.71          | 7.70      | -         | 7.26      | 7.49      | -         | 7.85      | 7.75      | 7.80      | 7.77      | 296.3                        | 302.6     | -         | 124.7     | 124.6     | -         | 126.5     | 124.6     | 126.6     | 131.1     |
| 9.0               | -                               | 98.5      | 96.9      | 98.5      | -         | 7.69          | 7.69      | -         | 7.58      | 7.49      | -         | 7.84      | 7.74      | 7.79      | -         | 294.3                        | 301.8     | -         | 124.4     | 125.2     | -         | 125.3     | 124.7     | 126.3     | -         |
| 10.0              | -                               | 97.0      | 96.8      | 98.1      | -         | 7.67          | -         | -         | 7.58      | 7.49      | -         | 7.83      | 7.72      | 7.78      | -         | 293.1                        | -         | -         | 123.9     | 124.4     | -         | 124.4     | 125.0     | 126.0     | -         |
| 11.0              | -                               | 96.6      | 96.8      | 97.7      | -         | 7.64          | -         | -         | 7.57      | 7.49      | -         | 7.82      | 7.72      | 7.77      | -         | 292.7                        | -         | -         | 123.9     | 124.7     | -         | 123.7     | 125.6     | 125.3     | -         |
| 12.0              | -                               | 96.1      | 96.6      | 97.1      | -         | 7.58          | -         | -         | -         | 7.49      | -         | 7.82      | 7.70      | 7.76      | -         | 291.8                        | -         | -         | -         | 125.3     | -         | 123.0     | 125.7     | 124.6     | -         |
| 13.0              | -                               | 95.3      | 96.5      | 96.4      | -         | 7.42          | -         | -         | -         | 7.49      | -         | 7.81      | 7.69      | 7.76      | -         | 292.7                        | -         | -         | -         | 125.9     | -         | 122.2     | 125.3     | 123.6     | -         |
| 14.0              | -                               | 94.5      | 96.0      | 95.5      | -         | 7.38          | -         | -         | -         | 7.49      | -         | 7.80      | 7.68      | 7.75      | -         | 298.1                        | -         | -         | -         | 125.8     | -         | 121.7     | 124.7     | 122.7     | -         |
| 15.0              | -                               | 94.0      | 95.3      | 94.7      | -         | 7.25          | -         | -         | -         | 7.49      | -         | 7.80      | 7.67      | 7.74      | -         | 305.1                        | -         | -         | -         | 124.9     | -         | 121.1     | 123.8     | 122.3     | -         |
| 16.0              | -                               | 93.2      | 94.6      | 94.0      | -         | -             | -         | -         | -         | 7.49      | -         | 7.78      | 7.66      | 7.74      | -         | -                            | -         | -         | -         | 123.4     | -         | 120.7     | 123.3     | 122.3     | -         |
| 17.0              | -                               | -         | 94.0      | 93.3      | -         | -             | -         | -         | -         | 7.48      | -         | -         | 7.65      | 7.72      | -         | -                            | -         | -         | -         | 122.9     | -         | -         | 123.3     | 122.1     | -         |
| 18.0              | -                               | -         | 94.2      | 92.7      | -         | -             | -         | -         | -         | 7.47      | -         | -         | 7.63      | 7.71      | -         | -                            | -         | -         | -         | 123.5     | -         | -         | 123.7     | 121.9     | -         |
| 19.0              | -                               | -         | 94.0      | 92.0      | -         | -             | -         | -         | -         | 7.46      | -         | -         | 7.62      | 7.70      | -         | -                            | -         | -         | -         | 125.2     | -         | -         | 123.7     | 121.8     | -         |
| 20.0              | -                               | -         | 93.8      | 91.2      | -         | -             | -         | -         | -         | 7.44      | -         | -         | 7.61      | 7.69      | -         | -                            | -         | -         | -         | 126.4     | -         | -         | 123.9     | 121.6     | -         |
| 21.0              | -                               | -         | -         | 90.9      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.68      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 121.4     | -         |
| 22.0              | -                               | -         | -         | 88.8      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.65      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 121.6     | -         |
| 23.0              | -                               | -         | -         | 87.8      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.63      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 121.5     | -         |
| 24.0              | -                               | -         | -         | 87.0      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.61      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 122.9     | -         |
| 25.0              | -                               | -         | -         | 85.3      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.59      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 122.8     | -         |
| 26.0              | -                               | -         | -         | 84.2      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.57      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 122.9     | -         |
| 27.0              | -                               | -         | -         | 82.2      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.54      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 122.6     | -         |
| 28.0              | -                               | -         | -         | 79.1      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.51      | -         | -                            | -         | -         | -         | -         | -         | -         | -         | 122.4     | -         |

Notes: Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.8, 9.7, 5.0, 11.5, 20.7, 7.3, 16.9, 20.0, 27.0, and 8.5 m, respectively, at the time of winter sampling. Ice thickness at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 1.32, 1.75, 1.40, 1.39, 1.43, 1.52, 1.65, 1.50, 1.33, and 1.40 m, respectively, at the time of winter sampling.

**Table C.63: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020**

| Depth<br>(m)      | Temperature (°C) |           |           |          |          |          |           |          |          |          | Dissolved Oxygen (mg/L) |           |           |          |          |          |           |          |          |          | Dissolved Oxygen (% Saturation) |           |           |          |          |
|-------------------|------------------|-----------|-----------|----------|----------|----------|-----------|----------|----------|----------|-------------------------|-----------|-----------|----------|----------|----------|-----------|----------|----------|----------|---------------------------------|-----------|-----------|----------|----------|
|                   | BLO-01-A         | BLO-01    | BLO-01-B  | BLO-05-A | BLO-05   | BLO-05-B | BLO-03    | BLO-04   | BLO-09   | BLO-06   | BLO-01-A                | BLO-01    | BLO-01-B  | BLO-05-A | BLO-05   | BLO-05-B | BLO-03    | BLO-04   | BLO-09   | BLO-06   | BLO-01-A                        | BLO-01    | BLO-01-B  | BLO-05-A | BLO-05   |
| Date<br>Collected | 30-Jul-20        | 30-Jul-20 | 30-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 31-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 30-Jul-20               | 30-Jul-20 | 30-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 31-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 30-Jul-20                       | 30-Jul-20 | 30-Jul-20 | 1-Aug-20 | 1-Aug-20 |
| 1.0               | 15.1             | 14.6      | 14.6      | 10.1     | 9.9      | 9.8      | 11.7      | 11.4     | 10.1     | 10.2     | 10.05                   | 10.25     | 10.19     | 11.30    | 11.36    | 11.24    | 10.81     | 10.94    | 11.20    | 11.19    | 99.9                            | 100.8     | 100.1     | 100.4    | 100.3    |
| 2.0               | 15.1             | 14.6      | 14.6      | 10.0     | 9.1      | 9.2      | 11.7      | 10.4     | 9.9      | 9.7      | 10.06                   | 10.28     | 10.20     | 11.35    | 11.46    | 11.36    | 10.83     | 11.10    | 11.23    | 11.28    | 100.2                           | 100.9     | 100.3     | 100.5    | 98.2     |
| 3.0               | 15.1             | 14.5      | 14.6      | 9.7      | 8.4      | 8.6      | 11.7      | 8.5      | 9.8      | 9.4      | 10.06                   | 10.34     | 10.20     | 11.42    | 11.59    | 11.42    | 10.83     | 11.48    | 11.24    | 11.33    | 100.0                           | 101.3     | 100.2     | 100.3    | 98.8     |
| 4.0               | 15.1             | 14.4      | 14.4      | 8.1      | 8.0      | 8.3      | 11.7      | 8.1      | 9.4      | 8.8      | 10.06                   | 10.35     | 10.26     | 11.63    | 11.65    | 11.47    | 10.83     | 11.53    | 11.31    | 11.43    | 100.0                           | 101.3     | 100.3     | 98.2     | 98.2     |
| 5.0               | 15.0             | 14.1      | -         | 7.7      | 7.3      | 8.0      | 11.6      | 7.8      | 9.0      | 8.0      | 10.05                   | 10.40     | -         | 11.63    | 11.68    | 11.50    | 10.83     | 11.57    | 11.34    | 11.55    | 99.7                            | 100.9     | -         | 97.3     | 97.0     |
| 6.0               | 13.3             | 13.7      | -         | 7.6      | 7.2      | 7.5      | 11.4      | 7.8      | 7.9      | 7.4      | 10.16                   | 10.55     | -         | 11.60    | 11.69    | 11.60    | 10.96     | 11.58    | 11.55    | 11.74    | 97.2                            | 101.1     | -         | 96.9     | 96.8     |
| 7.0               | 11.6             | 13.1      | -         | 7.4      | 7.1      | 7.0      | 9.9       | 7.7      | 7.5      | 7.0      | 10.40                   | 10.85     | -         | 11.60    | 11.69    | 11.63    | 11.20     | 11.58    | 11.62    | 11.83    | 95.6                            | 100.9     | -         | 96.5     | 96.4     |
| 8.0               | 9.3              | 11.7      | -         | 7.1      | 7.0      | -        | 9.9       | 7.5      | 7.4      | 6.8      | 10.20                   | 10.70     | -         | 11.59    | 11.68    | -        | 11.22     | 11.63    | 11.64    | 11.81    | 88.8                            | 97.2      | -         | 95.8     | 96.3     |
| 9.0               | 9.0              | 9.0       | -         | 7.1      | 7.0      | -        | 9.3       | 7.4      | 7.3      | -        | 10.08                   | 10.57     | -         | 11.59    | 11.67    | -        | 11.35     | 11.63    | 11.63    | -        | 87.0                            | 91.5      | -         | 95.7     | 96.1     |
| 10.0              | 8.0              | -         | -         | 6.8      | 6.7      | -        | 8.4       | 7.2      | 7.0      | -        | 9.88                    | -         | -         | 11.57    | 11.71    | -        | 11.50     | 11.63    | 11.69    | -        | 83.4                            | -         | -         | 94.6     | 95.7     |
| 11.0              | 7.5              | -         | -         | 6.4      | 6.5      | -        | 7.4       | 7.0      | 6.8      | -        | 9.37                    | -         | -         | 11.57    | 11.74    | -        | 11.61     | 11.65    | 11.69    | -        | 78.1                            | -         | -         | 93.8     | 95.4     |
| 12.0              | 7.4              | -         | -         | -        | 6.4      | -        | 6.9       | 7.0      | 6.4      | -        | 9.27                    | -         | -         | -        | 11.74    | -        | 11.68     | 11.60    | 11.71    | -        | 77.2                            | -         | -         | -        | 95.2     |
| 13.0              | 6.9              | -         | -         | -        | 6.3      | -        | 6.3       | 6.8      | 6.4      | -        | 8.90                    | -         | -         | -        | 11.74    | -        | 11.70     | 11.59    | 11.70    | -        | 73.3                            | -         | -         | -        | 95.1     |
| 14.0              | 6.8              | -         | -         | -        | 6.2      | -        | 5.5       | 6.6      | 6.4      | -        | 8.75                    | -         | -         | -        | 11.74    | -        | 11.75     | 11.60    | 11.70    | -        | 71.9                            | -         | -         | -        | 94.8     |
| 15.0              | 6.8              | -         | -         | -        | 6.2      | -        | 5.2       | 6.0      | 6.3      | -        | 8.65                    | -         | -         | -        | 11.74    | -        | 11.72     | 11.58    | 11.71    | -        | 70.9                            | -         | -         | -        | 94.8     |
| 16.0              | -                | -         | -         | -        | 6.2      | -        | 4.9       | 5.9      | 6.1      | -        | -                       | -         | -         | -        | 11.73    | -        | 11.72     | 11.57    | 11.71    | -        | -                               | -         | -         | -        | 94.6     |
| 17.0              | -                | -         | -         | -        | 6.1      | -        | 4.8       | 5.6      | 5.9      | -        | -                       | -         | -         | -        | 11.71    | -        | 11.71     | 11.56    | 11.67    | -        | -                               | -         | -         | -        | 94.4     |
| 18.0              | -                | -         | -         | -        | 6.1      | -        | -         | 5.6      | 5.6      | -        | -                       | -         | -         | -        | 11.70    | -        | -         | 11.56    | 11.70    | -        | -                               | -         | -         | -        | 94.2     |
| 19.0              | -                | -         | -         | -        | 6.1      | -        | -         | 5.5      | 5.5      | -        | -                       | -         | -         | -        | 11.66    | -        | -         | 11.55    | 11.69    | -        | -                               | -         | -         | -        | 93.9     |
| 20.0              | -                | -         | -         | -        | 6.0      | -        | -         | 5.4      | 5.4      | -        | -                       | -         | -         | -        | 11.64    | -        | -         | 11.53    | 11.67    | -        | -                               | -         | -         | -        | 93.6     |
| 21.0              | -                | -         | -         | -        | 5.7      | -        | -         | 5.3      | 5.0      | -        | -                       | -         | -         | -        | 11.50    | -        | -         | 11.52    | 11.72    | -        | -                               | -         | -         | -        | 91.8     |
| 22.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.8      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.76    | -        | -                               | -         | -         | -        | -        |
| 23.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.7      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.74    | -        | -                               | -         | -         | -        | -        |
| 24.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.7      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.74    | -        | -                               | -         | -         | -        | -        |
| 25.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.7      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.74    | -        | -                               | -         | -         | -        | -        |
| 26.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.6      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.73    | -        | -                               | -         | -         | -        | -        |
| 27.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.5      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.68    | -        | -                               | -         | -         | -        | -        |
| 28.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.4      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.64    | -        | -                               | -         | -         | -        | -        |
| 29.0              | -                | -         | -         | -        | -        | -        | -         | -        | 4.4      | -        | -                       | -         | -         | -        | -        | -        | -         | -        | 11.58    | -        | -                               | -         | -         | -        | -        |

Notes: Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.0, 10.3, 4.5, 11.7, 20.9, 7.5, 17.6, 21.2, 30.3, and 8.8 m, respectively, at the time of summer sampling.



**Table C.63: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Summer, Mary River Project CREMP, July 2020**

| Depth<br>(m)      | Dissolved Oxygen (% Saturation) |           |          |          |          | pH (pH units) |           |           |          |          |          |           |          |          |          | Specific Conductance (µS/cm) |           |           |          |          |          |           |          |          |          |
|-------------------|---------------------------------|-----------|----------|----------|----------|---------------|-----------|-----------|----------|----------|----------|-----------|----------|----------|----------|------------------------------|-----------|-----------|----------|----------|----------|-----------|----------|----------|----------|
|                   | BLO-05-B                        | BLO-03    | BLO-04   | BLO-09   | BLO-06   | BLO-01-A      | BLO-01    | BLO-01-B  | BLO-05-A | BLO-05   | BLO-05-B | BLO-03    | BLO-04   | BLO-09   | BLO-06   | BLO-01-A                     | BLO-01    | BLO-01-B  | BLO-05-A | BLO-05   | BLO-05-B | BLO-03    | BLO-04   | BLO-09   | BLO-06   |
| Date<br>Collected | 1-Aug-20                        | 31-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 30-Jul-20     | 30-Jul-20 | 30-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 31-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 30-Jul-20                    | 30-Jul-20 | 30-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 | 31-Jul-20 | 1-Aug-20 | 1-Aug-20 | 1-Aug-20 |
| 1.0               | 99.2                            | 99.5      | 100.2    | 99.6     | 99.5     | 8.38          | 8.37      | 8.35      | 7.73     | 7.85     | 7.92     | 8.26      | 8.34     | 7.84     | 7.55     | 151.8                        | 150.3     | 150.1     | 74.5     | 74.9     | 79.3     | 74.4      | 76.1     | 75.4     | 75.9     |
| 2.0               | 98.6                            | 99.8      | 99.0     | 99.2     | 99.0     | 8.33          | 8.36      | 8.34      | 7.72     | 7.81     | 7.77     | 8.08      | 8.10     | 7.81     | 7.69     | 152.0                        | 149.8     | 150.1     | 74.8     | 74.0     | 82.2     | 74.4      | 75.3     | 75.1     | 74.9     |
| 3.0               | 97.7                            | 99.7      | 97.8     | 98.9     | 98.9     | 8.33          | 8.35      | 8.35      | 7.73     | 7.76     | 7.86     | 7.95      | 7.99     | 7.79     | 7.67     | 152.0                        | 149.5     | 150.1     | 75.1     | 74.0     | 89.8     | 74.4      | 74.4     | 75.0     | 74.4     |
| 4.0               | 97.3                            | 99.7      | 97.6     | 98.5     | 98.4     | 8.32          | 8.35      | 8.35      | 7.72     | 7.73     | 7.80     | 7.94      | 7.88     | 7.77     | 7.69     | 152.1                        | 149.9     | 149.8     | 74.9     | 74.7     | 86.3     | 74.4      | 74.8     | 74.5     | 72.8     |
| 5.0               | 96.9                            | 99.6      | 97.3     | 98.0     | 97.2     | 8.31          | 8.34      | -         | 7.66     | 7.71     | 7.80     | 7.92      | 7.75     | 7.73     | 7.70     | 153.1                        | 147.0     | -         | 74.6     | 69.9     | 81.1     | 74.3      | 75.5     | 74.8     | 70.6     |
| 6.0               | 96.6                            | 98.9      | 97.2     | 96.7     | 97.8     | 8.29          | 8.33      | -         | 7.63     | 7.66     | 7.73     | 7.91      | 7.69     | 7.71     | 7.67     | 151.0                        | 138.9     | -         | 74.4     | 69.8     | 74.0     | 74.0      | 75.5     | 71.1     | 69.2     |
| 7.0               | 95.9                            | 98.9      | 96.9     | 97.0     | 97.2     | 8.19          | 8.31      | -         | 7.64     | 7.64     | 7.70     | 7.84      | 7.73     | 7.66     | 7.65     | 124.0                        | 125.2     | -         | 74.2     | 69.5     | 71.1     | 72.8      | 72.1     | 70.2     | 68.3     |
| 8.0               | -                               | 98.8      | 96.9     | 96.8     | 96.9     | 7.85          | 8.25      | -         | 7.62     | 7.63     | -        | 7.80      | 7.71     | 7.65     | 7.57     | 98.0                         | 111.0     | -         | 73.4     | 69.8     | -        | 72.7      | 70.1     | 70.0     | 68.0     |
| 9.0               | -                               | 99.0      | 96.8     | 96.5     | -        | 7.80          | 8.15      | -         | 7.60     | 7.62     | -        | 7.76      | 7.68     | 7.60     | -        | 93.2                         | 97.1      | -         | 73.2     | 69.7     | -        | 72.2      | 69.9     | 69.5     | -        |
| 10.0              | -                               | 98.3      | 96.2     | 96.1     | -        | 7.71          | -         | -         | 7.59     | 7.61     | -        | 7.71      | 7.66     | 7.60     | -        | 89.3                         | -         | -         | 73.4     | 68.9     | -        | 71.5      | 69.7     | 69.0     | -        |
| 11.0              | -                               | 96.8      | 95.4     | 95.9     | -        | 7.57          | -         | -         | 7.57     | 7.59     | -        | 7.65      | 7.64     | 7.61     | -        | 87.1                         | -         | -         | 72.4     | 68.5     | -        | 70.8      | 69.4     | 68.9     | -        |
| 12.0              | -                               | 96.0      | 95.5     | 95.2     | -        | 7.55          | -         | -         | -        | 7.58     | -        | 7.61      | 7.61     | 7.54     | -        | 86.0                         | -         | -         | -        | 68.4     | -        | 70.4      | 73.4     | 68.6     | -        |
| 13.0              | -                               | 94.6      | 95.1     | 95.1     | -        | 7.50          | -         | -         | -        | 7.56     | -        | 7.57      | 7.60     | 7.57     | -        | 84.1                         | -         | -         | -        | 68.3     | -        | 70.3      | 73.8     | 68.6     | -        |
| 14.0              | -                               | 93.1      | 94.7     | 94.9     | -        | 7.47          | -         | -         | -        | 7.56     | -        | 7.53      | 7.59     | 7.56     | -        | 83.8                         | -         | -         | -        | 68.2     | -        | 70.1      | 73.2     | 68.5     | -        |
| 15.0              | -                               | 92.1      | 93.3     | 94.7     | -        | 7.44          | -         | -         | -        | 7.56     | -        | 7.51      | 7.58     | 7.55     | -        | 83.3                         | -         | -         | -        | 68.2     | -        | 70.5      | 71.3     | 68.4     | -        |
| 16.0              | -                               | 91.4      | 92.4     | 94.4     | -        | -             | -         | -         | -        | 7.55     | -        | 7.49      | 7.55     | 7.55     | -        | -                            | -         | -         | -        | 68.2     | -        | 70.8      | 70.2     | 68.3     | -        |
| 17.0              | -                               | 91.3      | 92.0     | 93.6     | -        | -             | -         | -         | -        | 7.53     | -        | 7.47      | 7.53     | 7.46     | -        | -                            | -         | -         | -        | 68.2     | -        | 70.9      | 69.5     | 68.1     | -        |
| 18.0              | -                               | -         | 91.8     | 93.2     | -        | -             | -         | -         | -        | 7.54     | -        | -         | 7.53     | 7.53     | -        | -                            | -         | -         | -        | 68.3     | -        | -         | 68.6     | 67.8     | -        |
| 19.0              | -                               | -         | 91.6     | 92.9     | -        | -             | -         | -         | -        | 7.51     | -        | -         | 7.52     | 7.53     | -        | -                            | -         | -         | -        | 68.5     | -        | -         | 68.7     | 67.7     | -        |
| 20.0              | -                               | -         | 91.2     | 92.4     | -        | -             | -         | -         | -        | 7.51     | -        | -         | 7.50     | 7.52     | -        | -                            | -         | -         | -        | 68.6     | -        | -         | 68.7     | 67.5     | -        |
| 21.0              | -                               | -         | 90.8     | 91.7     | -        | -             | -         | -         | -        | 7.49     | -        | -         | 7.49     | 7.50     | -        | -                            | -         | -         | -        | 69.6     | -        | -         | 68.3     | 66.9     | -        |
| 22.0              | -                               | -         | -        | 91.4     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.47     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.6     | -        |          |
| 23.0              | -                               | -         | -        | 91.3     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.49     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.6     | -        |          |
| 24.0              | -                               | -         | -        | 91.2     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.48     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.6     | -        |          |
| 23.0              | -                               | -         | -        | 91.1     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.46     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.6     | -        |          |
| 24.0              | -                               | -         | -        | 90.8     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.46     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.6     | -        |          |
| 25.0              | -                               | -         | -        | 90.4     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.46     | -        | -                            | -         | -         | -        | -        | -        | -         | 66.8     | -        |          |
| 26.0              | -                               | -         | -        | 90.0     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.45     | -        | -                            | -         | -         | -        | -        | -        | -         | 67.0     | -        |          |
| 27.0              | -                               | -         | -        | 89.4     | -        | -             | -         | -         | -        | -        | -        | -         | -        | 7.45     | -        | -                            | -         | -         | -        | -        | -        | -         | 67.1     | -        |          |

Notes: Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.0, 10.3, 4.5, 11.7, 20.9, 7.5, 17.6, 21.2, 30.3, and 8.8 m, respectively, at the time of summer sampling.

Table C.64: In Situ Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020

| Depth (m)      | Temperature (°C) |           |           |           |           |           |           |           |           |           |           |           | Dissolved Oxygen (mg/L) |           |           |           |           |           |           |           |           |           |           |           |
|----------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                | BLO-01-A         | BLO-01    | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-09    | BLO-06    | BLO-01-A                | BLO-01    | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-09    | BLO-06    |
| Date Collected | 27-Aug-20        | 27-Aug-20 | 20-Aug-20 | 27-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 19-Aug-20 | 28-Aug-20 | 27-Aug-20               | 27-Aug-20 | 20-Aug-20 | 27-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 19-Aug-20 | 28-Aug-20 |
| surface        | -                | -         | 8.2       | -         | -         | -         | -         | -         | -         | -         | 8.00      | -         | -                       | -         | 11.40     | -         | -         | -         | -         | -         | -         | -         | 11.19     | -         |
| 1.0            | 7.3              | 7.5       | 8.2       | 7.5       | 8.7       | 8.3       | 8.1       | 8.0       | 7.8       | 7.8       | 8.0       | 7.5       | 11.76                   | 11.79     | 11.55     | 11.83     | 11.38     | 11.34     | 11.39     | 11.42     | 11.36     | 11.40     | 10.95     | 11.34     |
| 2.0            | 7.3              | 7.5       | 8.2       | 7.5       | 8.5       | 7.9       | 7.9       | 8.0       | 7.8       | 7.7       | 7.9       | 7.4       | 11.76                   | 11.75     | 11.42     | 11.82     | 11.42     | 11.42     | 11.42     | 11.42     | 11.38     | 11.39     | 11.04     | 11.35     |
| 3.0            | 7.3              | 7.5       | 8.2       | 7.4       | 7.9       | 7.9       | 7.7       | 7.9       | 7.6       | 7.6       | 7.9       | 7.4       | 11.75                   | 11.75     | 11.40     | 11.82     | 11.44     | 11.42     | 11.45     | 11.43     | 11.39     | 11.41     | 10.98     | 11.36     |
| 4.0            | 7.3              | 7.5       | 8.2       | 7.4       | 7.7       | 7.7       | 7.7       | 7.9       | 7.5       | 7.6       | 7.9       | 7.4       | 11.74                   | 11.74     | 11.40     | 11.81     | 11.43     | 11.43     | 11.44     | 11.43     | 11.39     | 11.38     | 10.93     | 11.36     |
| 5.0            | 7.3              | 7.5       | 8.2       | -         | 7.6       | 7.6       | 7.6       | 7.8       | 7.5       | 7.6       | 7.9       | 7.4       | 11.75                   | 11.74     | 11.39     | -         | 11.40     | 11.42     | 11.44     | 11.45     | 11.38     | 11.38     | 10.89     | 11.35     |
| 6.0            | 7.3              | 7.5       | 8.2       | -         | 7.6       | 7.6       | 7.6       | 7.6       | 7.5       | 7.6       | 7.9       | 7.4       | 11.73                   | 11.73     | 11.38     | -         | 11.38     | 11.41     | 11.47     | 11.44     | 11.37     | 11.37     | 10.90     | 11.34     |
| 7.0            | 7.3              | 7.4       | 8.2       | -         | 7.5       | 7.6       | -         | 7.5       | 7.5       | 7.6       | 7.9       | 7.4       | 11.73                   | 11.73     | 11.38     | -         | 11.39     | 11.40     | -         | 11.41     | 11.36     | 11.37     | 10.85     | 11.33     |
| 8.0            | 7.3              | 7.4       | 8.2       | -         | 7.5       | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.9       | 7.4       | 11.72                   | 11.71     | 11.38     | -         | 11.38     | 11.41     | -         | 11.40     | 11.35     | 11.36     | 10.86     | 11.33     |
| 9.0            | 7.3              | -         | 8.2       | -         | 7.5       | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.9       | 7.4       | 11.71                   | -         | 11.37     | -         | 11.37     | 11.42     | -         | 11.38     | 11.35     | 11.35     | 10.95     | 11.31     |
| 10.0           | 7.3              | -         | 8.2       | -         | 7.5       | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.8       | -         | 11.70                   | -         | 11.37     | -         | 11.36     | 11.42     | -         | 11.37     | 11.35     | 11.35     | 10.90     | -         |
| 11.0           | 7.3              | -         | -         | -         | -         | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.8       | -         | 11.72                   | -         | -         | -         | -         | 11.42     | -         | 11.35     | 11.34     | 11.33     | 10.89     | -         |
| 12.0           | 7.3              | -         | -         | -         | -         | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.8       | -         | 11.71                   | -         | -         | -         | -         | 11.42     | -         | 11.35     | 11.34     | 11.32     | 10.88     | -         |
| 13.0           | 7.2              | -         | -         | -         | -         | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.8       | -         | 11.72                   | -         | -         | -         | -         | 11.43     | -         | 11.34     | 11.33     | 11.32     | 10.87     | -         |
| 14.0           | 7.2              | -         | -         | -         | -         | 7.5       | -         | 7.5       | 7.5       | 7.6       | 7.7       | -         | 11.72                   | -         | -         | -         | -         | 11.42     | -         | 11.34     | 11.32     | 11.31     | 10.89     | -         |
| 15.0           | 7.2              | -         | -         | -         | -         | 7.5       | -         | -         | 7.5       | 7.5       | 7.7       | -         | 11.64                   | -         | -         | -         | -         | 11.41     | -         | -         | 11.32     | 11.30     | 10.89     | -         |
| 16.0           | 7.2              | -         | -         | -         | -         | 7.4       | -         | -         | 7.5       | 7.5       | 7.6       | -         | 11.65                   | -         | -         | -         | -         | 11.41     | -         | -         | 11.31     | 11.24     | 10.89     | -         |
| 17.0           | -                | -         | -         | -         | -         | 7.4       | -         | -         | 7.5       | 7.4       | 7.6       | -         | -                       | -         | -         | -         | -         | 11.49     | -         | -         | 11.31     | 11.15     | 10.90     | -         |
| 18.0           | -                | -         | -         | -         | -         | 7.3       | -         | -         | 7.5       | 7.4       | 7.5       | -         | -                       | -         | -         | -         | -         | 11.33     | -         | -         | 11.31     | 11.13     | 10.82     | -         |
| 19.0           | -                | -         | -         | -         | -         | 7.3       | -         | -         | 7.5       | 7.4       | 7.4       | -         | -                       | -         | -         | -         | -         | 11.31     | -         | -         | 11.30     | 11.11     | 10.95     | -         |
| 20.0           | -                | -         | -         | -         | -         | 7.3       | -         | -         | 7.5       | 7.3       | 7.2       | -         | -                       | -         | -         | -         | -         | 11.31     | -         | -         | 11.30     | 11.08     | 10.92     | -         |
| 21.0           | -                | -         | -         | -         | -         | -         | -         | -         | 7.5       | 7.3       | 7.2       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | 11.22     | 11.06     | 10.86     | -         |
| 22.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.3       | 7.1       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 11.04     | 10.78     | -         |
| 23.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.3       | 7.0       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 11.03     | 10.82     | -         |
| 24.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.3       | 7.0       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 11.01     | 10.80     | -         |
| 25.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.3       | 7.0       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 11.01     | 10.86     | -         |
| 26.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.3       | 6.8       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 10.99     | 10.82     | -         |
| 27.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | 7.2       | 6.7       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | 10.94     | 10.87     | -         |
| 28.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | -         | 6.6       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | -         | 10.85     | -         |
| 29.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | -         | 6.4       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | -         | 10.82     | -         |
| 30.0           | -                | -         | -         | -         | -         | -         | -         | -         | -         | -         | 6.3       | -         | -                       | -         | -         | -         | -         | -         | -         | -         | -         | -         | 10.68     | -         |

Notes: 19-Aug-20 and 20-Aug-20 sampling was conducted by Minnow. Mary Lake water profile sampling on all other dates was conducted by Baffinland. Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.1, 9.1, 5.0, 12.0, 20.6, 7.4, 15.3, 22.1, 29.7 and 9.5 m, respectively, at the time of fall sampling.

Table C.64: In Situ Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020

| Depth<br>(m)      | Dissolved Oxygen (% Saturation) |           |           |           |           |           |           |           |           |           |           |           | pH (pH units) |           |           |           |           |           |           |           |           |           |           |           |
|-------------------|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                   | BLO-01-A                        | BLO-01    | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-09    | BLO-06    | BLO-01-A      | BLO-01    | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-09    | BLO-06    |
| Date<br>Collected | 27-Aug-20                       | 27-Aug-20 | 20-Aug-20 | 27-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 19-Aug-20 | 28-Aug-20 | 27-Aug-20     | 27-Aug-20 | 20-Aug-20 | 27-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 19-Aug-20 | 28-Aug-20 |
| surface           | -                               | -         | 96.8      | -         | -         | -         | -         | -         | -         | -         | 96.6      | -         | -             | -         | 8.12      | -         | -         | -         | -         | -         | -         | -         | 7.42      | -         |
| 1.0               | 97.8                            | 98.4      | 98.2      | 98.6      | 97.8      | 96.4      | 96.4      | 96.5      | 95.6      | 95.7      | 94.3      | 94.6      | 8.23          | 8.25      | 8.13      | 8.26      | 7.83      | 7.90      | 7.77      | 7.78      | 7.76      | 7.72      | 7.39      | 7.71      |
| 2.0               | 97.8                            | 98.1      | 97.0      | 98.5      | 97.0      | 96.3      | 96.2      | 96.3      | 95.2      | 95.4      | 94.6      | 94.6      | 8.23          | 8.25      | 8.14      | 8.27      | 7.77      | 7.76      | 7.75      | 7.75      | 7.74      | 7.72      | 7.37      | 7.68      |
| 3.0               | 97.7                            | 98.0      | 96.8      | 98.5      | 96.2      | 96.2      | 96.0      | 96.3      | 95.2      | 95.4      | 94.2      | 94.6      | 8.23          | 8.25      | 8.14      | 8.27      | 7.76      | 7.74      | 7.75      | 7.74      | 7.73      | 7.72      | 7.38      | 7.68      |
| 4.0               | 97.6                            | 97.9      | 96.7      | 98.4      | 95.6      | 95.8      | 95.8      | 96.2      | 95.1      | 95.2      | 93.9      | 94.6      | 8.23          | 8.26      | 8.14      | 8.27      | 7.75      | 7.74      | 7.75      | 7.73      | 7.72      | 7.71      | 7.38      | 7.68      |
| 5.0               | 97.7                            | 97.8      | 96.7      | -         | 95.3      | 95.4      | 95.6      | 96.3      | 95.0      | 95.1      | 93.5      | 94.5      | 8.22          | 8.25      | 8.15      | -         | 7.75      | 7.74      | 7.75      | 7.72      | 7.71      | 7.71      | 7.37      | 7.68      |
| 6.0               | 97.5                            | 97.8      | 96.6      | -         | 95.2      | 95.4      | 95.8      | 95.6      | 94.9      | 95.0      | 93.5      | 94.4      | 8.23          | 8.25      | 8.14      | -         | 7.74      | 7.74      | 7.76      | 7.72      | 7.72      | 7.71      | 7.38      | 7.68      |
| 7.0               | 97.5                            | 97.7      | 96.6      | -         | 95.1      | 95.3      | -         | 95.3      | 94.9      | 95.0      | 93.1      | 94.4      | 8.23          | 8.25      | 8.15      | -         | 7.74      | 7.74      | -         | 7.72      | 7.72      | 7.71      | 7.35      | 7.67      |
| 8.0               | 97.4                            | 97.6      | 96.6      | -         | 95.0      | 95.2      | -         | 95.1      | 94.8      | 94.9      | 93.1      | 94.3      | 8.23          | 8.24      | 8.14      | -         | 7.74      | 7.74      | -         | 7.71      | 7.72      | 7.71      | 7.36      | 7.67      |
| 9.0               | 97.3                            | -         | 96.5      | -         | 94.9      | 95.2      | -         | 95.4      | 94.7      | 94.9      | 93.9      | 94.3      | 8.22          | -         | 8.14      | -         | 7.75      | 7.74      | -         | 7.70      | 7.72      | 7.71      | 7.38      | 7.67      |
| 10.0              | 97.2                            | -         | 96.5      | -         | 94.7      | 95.3      | -         | 94.8      | 94.7      | 94.8      | 93.6      | -         | 8.23          | -         | 8.14      | -         | 7.76      | 7.75      | -         | 7.70      | 7.72      | 7.71      | 7.36      | -         |
| 11.0              | 97.3                            | -         | -         | -         | -         | 95.3      | -         | 94.7      | 94.6      | 94.7      | 93.2      | -         | 8.24          | -         | -         | -         | -         | 7.78      | -         | 7.70      | 7.73      | 7.71      | 7.36      | -         |
| 12.0              | 97.2                            | -         | -         | -         | -         | 95.3      | -         | 94.6      | 94.6      | 94.6      | 93.3      | -         | 8.23          | -         | -         | -         | -         | 7.78      | -         | 7.70      | 7.72      | 7.71      | 7.36      | -         |
| 13.0              | 97.2                            | -         | -         | -         | -         | 95.3      | -         | 94.5      | 94.6      | 94.5      | 93.2      | -         | 8.23          | -         | -         | -         | -         | 7.78      | -         | 7.69      | 7.72      | 7.71      | 7.36      | -         |
| 14.0              | 97.1                            | -         | -         | -         | -         | 95.3      | -         | 94.5      | 94.5      | 94.5      | 93.2      | -         | 8.22          | -         | -         | -         | -         | 7.80      | -         | 7.69      | 7.72      | 7.71      | 7.36      | -         |
| 15.0              | 96.4                            | -         | -         | -         | -         | 95.1      | -         | -         | 94.4      | 94.3      | 92.8      | -         | 8.22          | -         | -         | -         | -         | 7.81      | -         | -         | 7.72      | 7.71      | 7.36      | -         |
| 16.0              | 96.5                            | -         | -         | -         | -         | 95.0      | -         | -         | 94.4      | 93.8      | 93.0      | -         | 8.22          | -         | -         | -         | -         | 7.81      | -         | -         | 7.72      | 7.70      | 7.35      | -         |
| 17.0              | -                               | -         | -         | -         | -         | 94.7      | -         | -         | 94.3      | 92.8      | 93.0      | -         | -             | -         | -         | -         | -         | 7.81      | -         | -         | 7.72      | 7.67      | 7.33      | -         |
| 18.0              | -                               | -         | -         | -         | -         | 94.1      | -         | -         | 94.3      | 92.6      | 92.0      | -         | -             | -         | -         | -         | -         | 7.81      | -         | -         | 7.72      | 7.66      | 7.33      | -         |
| 19.0              | -                               | -         | -         | -         | -         | 93.9      | -         | -         | 94.3      | 92.4      | 92.5      | -         | -             | -         | -         | -         | -         | 7.78      | -         | -         | 7.72      | 7.65      | 7.32      | -         |
| 20.0              | -                               | -         | -         | -         | -         | 93.9      | -         | -         | 94.3      | 92.1      | 92.0      | -         | -             | -         | -         | -         | -         | 7.78      | -         | -         | 7.72      | 7.64      | 7.30      | -         |
| 21.0              | -                               | -         | -         | -         | -         | -         | -         | -         | 93.8      | 91.9      | 91.6      | -         | -             | -         | -         | -         | -         | -         | -         | -         | 7.70      | 7.64      | 7.28      | -         |
| 22.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 91.7      | 90.8      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.64      | 7.26      | -         |
| 23.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 91.6      | 90.9      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.63      | 7.25      | -         |
| 24.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 91.4      | 90.7      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.65      | 7.24      | -         |
| 25.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 91.3      | 91.2      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.63      | 7.22      | -         |
| 26.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 91.1      | 90.4      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.62      | 7.20      | -         |
| 27.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | 90.7      | 89.9      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | 7.61      | 7.18      | -         |
| 28.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | -         | 90.2      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | -         | 7.17      | -         |
| 29.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | -         | 89.5      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | -         | 7.15      | -         |
| 30.0              | -                               | -         | -         | -         | -         | -         | -         | -         | -         | -         | 88.4      | -         | -             | -         | -         | -         | -         | -         | -         | -         | -         | -         | 7.03      | -         |

Notes: 19-Aug-20 and 20-Aug-20 sampling was conducted by Minnow. Mary Lake water profile sampling on all other dates was conducted by Baffinland. Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.1, 5.0, 9.5, 12.0, 20.6, 7.4, 15.3, 22.1, 29.7 and 9.5 m, respectively, at the time of fall sampling.

**Table C.64: *In Situ* Water Quality Profile Data Collected at Mary Lake Water Quality Monitoring Stations in Fall, Mary River Project CREMP, August 2020**

| Depth<br>(m)      | Specific Conductance (µS/cm) |           |           |           |           |           |           |           |           |           |           |           |
|-------------------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                   | BLO-01-A                     | BLO-01    | BLO-01    | BLO-01-B  | BLO-05-A  | BLO-05    | BLO-05-B  | BLO-03    | BLO-04    | BLO-09    | BLO-09    | BLO-06    |
| Date<br>Collected | 27-Aug-20                    | 27-Aug-20 | 20-Aug-20 | 27-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 19-Aug-20 | 28-Aug-20 |
| surface           | -                            | -         | 192.0     | -         | -         | -         | -         | -         | -         | -         | 83.4      | -         |
| 1.0               | 216.3                        | 214.5     | 192.1     | 215.4     | 86.9      | 85.1      | 86.1      | 80.4      | 85.5      | 85.8      | 83.1      | 85.6      |
| 2.0               | 216.3                        | 214.5     | 192.1     | 215.4     | 87.9      | 85.9      | 85.9      | 80.4      | 85.8      | 85.7      | 83.0      | 85.6      |
| 3.0               | 216.3                        | 214.7     | 192.2     | 215.5     | 87.0      | 86.3      | 86.2      | 80.4      | 85.8      | 85.7      | 83.0      | 85.6      |
| 4.0               | 216.4                        | 215.1     | 192.1     | 215.6     | 86.7      | 86.1      | 86.4      | 80.4      | 85.4      | 85.8      | 83.0      | 85.6      |
| 5.0               | 216.4                        | 215.3     | 192.2     | -         | 86.6      | 86.3      | 86.1      | 80.5      | 85.4      | 85.7      | 83.0      | 85.6      |
| 6.0               | 216.4                        | 215.2     | 192.0     | -         | 86.9      | 86.5      | 85.6      | 80.8      | 85.3      | 85.7      | 83.1      | 85.6      |
| 7.0               | 216.5                        | 215.5     | 192.1     | -         | 88.2      | 87.1      | -         | 80.6      | 85.3      | 85.7      | 83.2      | 85.6      |
| 8.0               | 216.5                        | 215.8     | 192.1     | -         | 94.9      | 91.2      | -         | 80.7      | 85.3      | 85.7      | 83.2      | 85.6      |
| 9.0               | 216.5                        | -         | 192.0     | -         | 94.8      | 96.1      | -         | 80.7      | 85.3      | 85.8      | 83.4      | 85.6      |
| 10.0              | 216.7                        | -         | 192.0     | -         | 94.9      | 96.6      | -         | 80.7      | 85.2      | 85.8      | 83.4      | -         |
| 11.0              | 216.9                        | -         | -         | -         | -         | 98.5      | -         | 80.7      | 85.3      | 85.8      | 83.5      | -         |
| 12.0              | 216.4                        | -         | -         | -         | -         | 102.8     | -         | 80.7      | 85.2      | 85.8      | 83.5      | -         |
| 13.0              | 217.8                        | -         | -         | -         | -         | 104.8     | -         | 80.8      | 85.2      | 85.9      | 82.8      | -         |
| 14.0              | 218.1                        | -         | -         | -         | -         | 104.9     | -         | 80.8      | 85.2      | 85.9      | 81.5      | -         |
| 15.0              | 217.9                        | -         | -         | -         | -         | 102.6     | -         | -         | 85.2      | 86.0      | 80.7      | -         |
| 16.0              | 218.0                        | -         | -         | -         | -         | 102.4     | -         | -         | 85.0      | 87.1      | 79.6      | -         |
| 17.0              | -                            | -         | -         | -         | -         | 102.0     | -         | -         | 84.9      | 87.9      | 79.1      | -         |
| 18.0              | -                            | -         | -         | -         | -         | 102.3     | -         | -         | 84.5      | 88.1      | 79.4      | -         |
| 19.0              | -                            | -         | -         | -         | -         | 102.6     | -         | -         | 84.4      | 88.2      | 77.6      | -         |
| 20.0              | -                            | -         | -         | -         | -         | 102.5     | -         | -         | 84.5      | 88.4      | 77.2      | -         |
| 21.0              | -                            | -         | -         | -         | -         | -         | -         | -         | 84.5      | 86.7      | 77.3      | -         |
| 22.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 89.1      | 76.4      | -         |
| 23.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 89.2      | 75.9      | -         |
| 24.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 89.4      | 75.8      | -         |
| 25.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 89.5      | 75.3      | -         |
| 26.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 90.0      | 74.6      | -         |
| 27.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | 90.0      | 74.2      | -         |
| 28.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | -         | 73.9      | -         |
| 29.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | -         | 73.3      | -         |
| 30.0              | -                            | -         | -         | -         | -         | -         | -         | -         | -         | -         | 73.3      | -         |

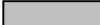
Notes: 19-Aug-20 and 20-Aug-20 sampling was conducted by Minnow. Mary Lake water profile sampling on all other dates was conducted by Baffinland. Total depth at stations BLO-01-A, BLO-01, BLO-01-B, BLO-05-A, BLO-05, BLO-05-B, BLO-03, BLO-04, BLO-09, and BLO-06 was 15.1, 5.0, 9.5, 12.0, 20.6, 7.4, 15.3, 22.1, 29.7 and 9.5 m, respectively, at the time of fall sampling.

**Table C.65: Sampling Depth, Water Clarity Measures, and Surface and Bottom *In Situ* Water Quality Measures Collected at Mary Lake Benthic Invertebrate Community Stations, Mary River Project CREMP, August 2020**

| Categorization & Replicate ID |        | Date Sampled | Station Depth (m) | Secchi Depth (m) | Depth sampled | Temperature (°C) | Dissolved Oxygen |          | pH (units) | Specific Conductance (µS/cm) |
|-------------------------------|--------|--------------|-------------------|------------------|---------------|------------------|------------------|----------|------------|------------------------------|
|                               |        |              |                   |                  |               |                  | (mg/L)           | (% sat.) |            |                              |
| Littoral (Shallow) Stations   | BLO-01 | 20-Aug-20    | 10.0              | 4.78             | surface       | 8.2              | 11.40            | 96.8     | 8.12       | 192.0                        |
|                               |        |              |                   |                  | bottom        | 9.2              | 11.37            | 96.5     | 8.14       | 192.0                        |
|                               | BLO-11 | 16-Aug-20    | 9.3               | 3.33             | surface       | 9.3              | 10.46            | 93.8     | 7.20       | 80.7                         |
|                               |        |              |                   |                  | bottom        | 9.4              | 10.35            | 92.9     | 7.26       | 84.2                         |
|                               | BLO-07 | 16-Aug-20    | 12.8              | 3.79             | surface       | 8.9              | 10.99            | 97.5     | 7.01       | 76.0                         |
|                               |        |              |                   |                  | bottom        | 8.8              | 10.62            | 94.0     | 6.74       | 76.4                         |
|                               | BLO-06 | 16-Aug-20    | 6.7               | 4.38             | surface       | 8.8              | 10.67            | 94.3     | 6.96       | 76.0                         |
|                               |        |              |                   |                  | bottom        | 8.5              | 10.59            | 92.9     | 6.93       | 76.0                         |
| Profundal (Deep) Stations     | BLO-03 | 16-Aug-20    | 16.4              | 3.94             | surface       | 9.2              | 10.62            | 94.8     | 7.19       | 74.8                         |
|                               |        |              |                   |                  | bottom        | 6.4              | 11.26            | 94.1     | 6.97       | 72.2                         |
|                               | BLO-15 | 16-Aug-20    | 29.1              | 3.16             | surface       | 9.1              | 10.71            | 95.5     | 7.24       | 74.9                         |
|                               |        |              |                   |                  | bottom        | 4.6              | 10.75            | 85.5     | 6.89       | 72.3                         |
|                               | BLO-14 | 20-Aug-20    | 20.0              | 5.28             | surface       | 7.8              | 11.46            | 96.3     | 7.90       | 76.9                         |
|                               |        |              |                   |                  | bottom        | 7.6              | 11.43            | 95.7     | 7.69       | 76.9                         |
|                               | BLO-05 | 16-Aug-20    | 21.5              | 3.18             | surface       | 9.3              | 10.58            | 95.1     | 7.32       | 80.9                         |
|                               |        |              |                   |                  | bottom        | 5.8              | 10.25            | 84.5     | 7.13       | 69.5                         |
|                               | BLO-13 | 19-Aug-20    | 22.0              | 1.95             | surface       | 7.8              | 11.11            | 95.2     | 7.46       | 82.8                         |
|                               |        |              |                   |                  | bottom        | 7.5              | 10.89            | 92.9     | 7.30       | 90.6                         |
|                               | BLO-04 | 19-Aug-20    | 22.0              | 1.63             | surface       | 7.8              | 11.05            | 94.7     | 7.41       | 83.4                         |
|                               |        |              |                   |                  | bottom        | 7.6              | 10.68            | 91.7     | 7.28       | 84.7                         |

**Table C.66: Statistical Comparison of Bottom *In Situ* Water Quality Between Mary Lake Littoral and Profundal Stations, Mary River Project CREMP, August 2020**

| Parameter                       | Statistical Test Results      |                 |                                       |         | Summary Statistics |             |       |                    |                |         |         |
|---------------------------------|-------------------------------|-----------------|---------------------------------------|---------|--------------------|-------------|-------|--------------------|----------------|---------|---------|
|                                 | Statistical Test <sup>a</sup> | Transform-ation | Significant Difference Between Areas? | P-value | Lake Zone          | Sample Size | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Secchi Depth (m)                | tequal                        | none            | NO                                    | 0.261   | Littoral           | 4           | 4.07  | 0.64               | 0.32           | 3.33    | 4.78    |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 3.19  | 1.34               | 0.55           | 1.63    | 5.28    |
| Temperature (°C)                | tequal                        | none            | YES                                   | 0.006   | Littoral           | 4           | 8.98  | 0.40               | 0.20           | 8.50    | 9.40    |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 6.58  | 1.22               | 0.50           | 4.60    | 7.60    |
| Dissolved Oxygen (mg/L)         | tequal                        | none            | NO                                    | 0.618   | Littoral           | 4           | 10.7  | 0.4                | 0.2            | 10.4    | 11.4    |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 10.9  | 0.4                | 0.2            | 10.3    | 11.4    |
| Dissolved Oxygen (% saturation) | tequal                        | none            | NO                                    | 0.212   | Littoral           | 4           | 94.1  | 1.7                | 0.8            | 92.9    | 96.5    |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 90.7  | 4.6                | 1.9            | 84.5    | 95.7    |
| pH (units)                      | tequal                        | none            | NO                                    | 0.845   | Littoral           | 4           | 7.27  | 0.62               | 0.31           | 6.74    | 8.14    |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 7.21  | 0.29               | 0.12           | 6.89    | 7.69    |
| Specific Conductance (umho/cm)  | M-W                           | rank            | NO                                    | 0.476   | Littoral           | 4           | 107.2 | 56.7               | 28.3           | 76.0    | 192.0   |
|                                 |                               |                 |                                       |         | Profundal          | 6           | 77.7  | 8.3                | 3.4            | 69.5    | 90.6    |

 Shaded values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).

**Table C.67: Statistical Comparison of Bottom *In Situ* Water Quality Between Mary Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Parameter                       | Statistical Test Results      |                |                                       |         | Summary Statistics |                 |       |                    |                |         |         |
|-----------------------------|---------------------------------|-------------------------------|----------------|---------------------------------------|---------|--------------------|-----------------|-------|--------------------|----------------|---------|---------|
|                             |                                 | Statistical Test <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Station Depth (m)               | tequal                        | none           | NO                                    | 0.833   | Reference          | 4               | 10.0  | 1.1                | 0.5            | 8.5     | 11.0    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 9.7   | 2.5                | 1.3            | 6.7     | 12.8    |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 8.12  | 0.64               | 0.29           | 7.38    | 9.15    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 4.07  | 0.64               | 0.32           | 3.33    | 4.78    |
|                             | Temperature (°C)                | tequal                        | none           | NO                                    | 0.180   | Reference          | 5               | 9.32  | 0.29               | 0.13           | 8.90    | 9.70    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 8.98  | 0.40               | 0.20           | 8.50    | 9.40    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | none           | YES                                   | 0.002   | Reference          | 5               | 12.6  | 0.7                | 0.3            | 11.8    | 13.3    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 10.7  | 0.4                | 0.2            | 10.4    | 11.4    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 111.9 | 5.2                | 2.3            | 104.6   | 116.7   |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 94.1  | 1.7                | 0.8            | 92.9    | 96.5    |
| Profundal (Deep) Stations   | pH (units)                      | tequal                        | none           | NO                                    | 0.801   | Reference          | 5               | 7.19  | 0.23               | 0.10           | 6.94    | 7.56    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 7.27  | 0.62               | 0.31           | 6.74    | 8.14    |
|                             | Specific Conductance (umho/cm)  | M-W                           | rank           | NO                                    | 0.190   | Reference          | 5               | 76.7  | 3.2                | 1.4            | 74.5    | 82.1    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 4               | 107.2 | 56.7               | 28.3           | 76.0    | 192.0   |
|                             | Station Depth (m)               | tequal                        | none           | NO                                    | 0.547   | Reference          | 5               | 20.6  | 1.6                | 0.7            | 19.0    | 23.0    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 21.8  | 4.1                | 1.7            | 16.4    | 29.1    |
|                             | Secchi Depth (m)                | tequal                        | none           | YES                                   | 0.001   | Reference          | 5               | 8.39  | 0.96               | 0.43           | 7.18    | 9.84    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 3.19  | 1.34               | 0.55           | 1.63    | 5.28    |
|                             | Temperature (°C)                | tunequal                      | none           | NO                                    | 0.189   | Reference          | 5               | 5.82  | 0.19               | 0.09           | 5.60    | 6.10    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 6.58  | 1.22               | 0.50           | 4.60    | 7.60    |
|                             | Dissolved Oxygen (mg/L)         | tequal                        | log10          | YES                                   | 0.001   | Reference          | 5               | 13.6  | 1.3                | 0.6            | 12.8    | 15.8    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 10.9  | 0.4                | 0.2            | 10.3    | 11.4    |
|                             | Dissolved Oxygen (% saturation) | tequal                        | log10          | YES                                   | 0.001   | Reference          | 5               | 110.6 | 10.3               | 4.6            | 103.5   | 127.9   |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 90.7  | 4.6                | 1.9            | 84.5    | 95.7    |
|                             | pH (units)                      | tequal                        | none           | YES                                   | 0.018   | Reference          | 5               | 6.70  | 0.30               | 0.13           | 6.27    | 6.95    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 7.21  | 0.29               | 0.12           | 6.89    | 7.69    |
|                             | Specific Conductance (umho/cm)  | tequal                        | none           | NO                                    | 0.580   | Reference          | 5               | 75.5  | 1.6                | 0.7            | 74.0    | 78.1    |
|                             |                                 |                               |                |                                       |         | Mary Lake          | 6               | 77.7  | 8.3                | 3.4            | 69.5    | 90.6    |

Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Student's t-test assuming equal variance (tequal), Student's t-test assuming unequal variance (tunequal), or Mann-Whitney U-test (M-W).







**Table C.69: Summary of the Magnitude of Elevation in Seasonal Average Parameter Concentrations (Total Metal Concentration Provided) Between Mary Lake and Reference Lake 3 in 2020, and at Mary Lake Between 2020 and the Baseline Period**

| Parameter                          | Mary Lake North Basin    |      |                  |        |      | Mary Lake South Basin    |      |                  |        |      |
|------------------------------------|--------------------------|------|------------------|--------|------|--------------------------|------|------------------|--------|------|
|                                    | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      |
|                                    | Summer                   | Fall | Winter           | Summer | Fall | Summer                   | Fall | Winter           | Summer | Fall |
| Conductivity (lab)                 | 1.7                      | 2.8  | 1.2              | 1.3    | 1.3  | 1.0                      | 1.1  | 1.3              | 1.2    | 1.1  |
| Hardness (as CaCO <sub>3</sub> )   | 1.8                      | 2.8  | 1.3              | 1.2    | 1.2  | 1.0                      | 1.1  | 1.5              | 1.1    | 1.1  |
| Total Suspended Solids (TSS)       | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.1                      | 1.0  | 1.0              | 0.6    | 1.0  |
| Total Dissolved Solids (TDS)       | 2.0                      | 2.4  | 1.1              | 1.2    | 1.1  | 1.2                      | 1.0  | 1.4              | 1.1    | 1.0  |
| Turbidity                          | 6.2                      | 4.6  | 0.7              | 0.3    | 0.8  | 13                       | 9.7  | 0.2              | 1.1    | 1.2  |
| Alkalinity (as CaCO <sub>3</sub> ) | 1.3                      | 2.9  | 1.1              | 1.1    | 1.2  | 0.9                      | 1.1  | 1.3              | 1.3    | 1.0  |
| Total Ammonia                      | 1.0                      | 0.7  | 0.1              | 0.1    | 0.1  | 1.0                      | 0.7  | 0.1              | 0.1    | 0.1  |
| Nitrate                            | 0.4                      | 2.9  | 1.1              | 0.1    | 0.6  | 1.9                      | 2.2  | 0.5              | 0.4    | 0.4  |
| Nitrite                            | 0.2                      | 1.0  | 1.2              | 0.3    | 0.8  | 1.6                      | 1.0  | 1.6              | 0.4    | 1.1  |
| Total Kjeldahl Nitrogen (TKN)      | 0.7                      | 1.0  | 0.8              | 0.3    | 0.6  | 1.0                      | 1.0  | 1.1              | 0.9    | 0.9  |
| Dissolved Organic Carbon           | 0.7                      | 0.7  | 1.7              | 1.6    | 1.5  | 0.7                      | 0.5  | 2.0              | 1.6    | 1.4  |
| Total Organic Carbon               | 0.4                      | 1.8  | 2.3              | 1.0    | 3.8  | 0.6                      | 0.6  | 2.4              | 1.9    | 1.5  |
| Total Phosphorus                   | 1.1                      | 2.1  | 0.5              | 0.6    | 0.9  | 1.1                      | 1.7  | 0.9              | 0.8    | 0.8  |
| Phenols                            | 1.0                      | 1.0  | 2.2              | 1.0    | 1.0  | 1.0                      | 1.1  | 1.6              | 1.0    | 1.1  |
| Bromide (Br)                       | 0.5                      | 1.0  | 0.5              | 0.3    | 0.7  | 1.6                      | 1.0  | 0.9              | 0.7    | 0.4  |
| Chloride (Cl)                      | 3.1                      | 6.9  | 2.0              | 2.4    | 2.4  | 2.0                      | 2.5  | 1.5              | 1.2    | 1.2  |
| Sulphate (SO <sub>4</sub> )        | 0.5                      | 1.1  | 1.3              | 0.8    | 1.0  | 0.5                      | 0.6  | 2.1              | 0.9    | 0.8  |
| Aluminum (Al)                      | 8.3                      | 6.6  | 0.6              | 0.3    | 0.3  | 21                       | 12   | 0.5              | 1.0    | 1.1  |
| Antimony (Sb)                      | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Arsenic (As)                       | 1.2                      | 1.0  | 1.0              | 1.2    | 0.5  | 1.0                      | 1.0  | 1.0              | 1.0    | 0.9  |
| Barium (Ba)                        | 1.1                      | 1.6  | 1.2              | 1.1    | 1.2  | 0.7                      | 0.7  | 1.4              | 1.0    | 1.0  |
| Beryllium (Be)                     | 0.2                      | 1.0  | 1.5              | 0.3    | 1.0  | 1.0                      | 1.0  | 1.1              | 1.5    | 2.0  |
| Bismuth (Bi)                       | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Boron (B)                          | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Cadmium (Cd)                       | 0.5                      | 1.0  | 0.8              | 0.4    | 0.7  | 1.0                      | 1.0  | 0.2              | 0.9    | 0.8  |
| Calcium (Ca)                       | 1.8                      | 2.9  | 1.3              | 1.1    | 1.2  | 1.0                      | 1.1  | 1.4              | 1.0    | 1.0  |
| Chromium (Cr)                      | 0.3                      | 1.0  | 1.4              | 0.2    | 0.7  | 1.0                      | 1.0  | 1.2              | 1.1    | 1.1  |
| Cobalt (Co)                        | 1.0                      | 1.0  | 1.0              | 0.8    | 0.7  | 1.0                      | 1.0  | 1.0              | 0.9    | 0.9  |
| Copper (Cu)                        | 1.3                      | 1.3  | 1.0              | 1.0    | 0.4  | 0.8                      | 0.8  | 1.0              | 0.7    | 0.7  |
| Iron (Fe)                          | 1.8                      | 1.0  | 1.2              | 0.6    | 0.3  | 2.2                      | 1.3  | 1.0              | 0.9    | 0.9  |
| Lead (Pb)                          | 1.0                      | 1.0  | 0.9              | 0.7    | 0.7  | 1.4                      | 1.0  | 0.9              | 0.9    | 0.9  |
| Lithium (Li)                       | 1.0                      | 1.3  | 0.5              | 0.3    | 0.3  | 1.0                      | 1.0  | 0.2              | 0.3    | 0.4  |
| Magnesium (Mg)                     | 1.8                      | 2.7  | 1.3              | 1.2    | 1.3  | 1.0                      | 1.1  | 1.5              | 1.1    | 1.1  |
| Manganese (Mn)                     | 5.3                      | 3.5  | 0.6              | 1.1    | 0.2  | 2.5                      | 1.7  | 0.5              | 0.9    | 1.0  |
| Mercury (Hg)                       | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  |
| Molybdenum (Mo)                    | 1.5                      | 2.1  | 1.2              | 1.5    | 1.4  | 7.6                      | 1.1  | 1.6              | 9.3    | 1.2  |
| Nickel (Ni)                        | 1.0                      | 1.0  | 0.9              | 1.0    | 0.9  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Potassium (K)                      | 1.0                      | 1.3  | 1.1              | 1.5    | 1.5  | 0.7                      | 0.7  | 1.2              | 1.2    | 1.2  |
| Selenium (Se)                      | 0.1                      | 1.0  | 2.8              | 0.1    | 1.8  | 1.0                      | 1.0  | 1.2              | 1.4    | 1.9  |
| Silicon (Si)                       | 1.3                      | 1.5  | 1.2              | 1.0    | 0.8  | 1.1                      | 1.0  | 1.2              | 1.0    | 1.1  |
| Silver (Ag)                        | 1.0                      | 1.0  | 1.6              | 1.8    | 1.8  | 1.0                      | 1.0  | 1.2              | 1.9    | 2.3  |
| Sodium (Na)                        | 2.7                      | 4.5  | 1.6              | 2.9    | 2.1  | 1.4                      | 1.7  | 1.5              | 1.6    | 1.6  |
| Strontium (Sr)                     | 1.2                      | 2.0  | 1.4              | 1.4    | 1.4  | 0.7                      | 0.9  | 1.2              | 1.0    | 0.9  |
| Thallium (Tl)                      | 0.1                      | 1.0  | 1.6              | 0.1    | 1.0  | 1.0                      | 1.0  | 1.1              | 1.5    | 2.1  |
| Tin (Sn)                           | 1.0                      | 1.0  | 0.1              | 0.0    | 0.0  | 1.0                      | 1.0  | 0.2              | 0.1    | 0.1  |
| Titanium (Ti)                      | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Uranium (U)                        | 3.9                      | 10   | 1.5              | 1.5    | 1.5  | 2.2                      | 2.9  | 1.8              | 1.5    | 1.4  |
| Vanadium (V)                       | 0.5                      | 1.0  | 1.0              | 0.5    | 0.5  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Zinc (Zn)                          | 1.0                      | 1.0  | 1.6              | 1.6    | -    | 1.3                      | 1.0  | 1.7              | 1.8    | 1.4  |

- Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).
- Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).
- Denotes highly elevated concentration (mean concentration greater than 10 times higher than respective mean reference or baseline period value).
- Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.

Table C.70: Dissolved Metal Concentrations at Mary Lake North Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Winter Sampling Event |            |            |            |            |            | Summer Sampling Event |            |            |            |            |            | Fall Sampling Event |            |            |            |            |            |
|------------------|-----------------|-------|-----------------------|------------|------------|------------|------------|------------|-----------------------|------------|------------|------------|------------|------------|---------------------|------------|------------|------------|------------|------------|
|                  |                 |       | BL0-01-A              | BL0-01-A   | BL0-01     | BL0-01     | BL0-01-B   | BL0-01-B   | BL0-01-A              | BL0-01-A   | BL0-01     | BL0-01     | BL0-01-B   | BL0-01-B   | BL0-01-A            | BL0-01-A   | BL0-01     | BL0-01     | BL0-01-B   | BL0-01-B   |
|                  |                 |       | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom              | surface    | bottom     | surface    | bottom     | surface    |
|                  |                 |       | 19-Apr-20             | 19-Apr-20  | 19-Apr-20  | 19-Apr-20  | 19-Apr-20  | 19-Apr-20  | 30-Jul-20             | 30-Jul-20  | 30-Jul-20  | 30-Jul-20  | 30-Jul-20  | 30-Jul-20  | 27-Aug-20           | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  | 27-Aug-20  |
| Dissolved Metals | Aluminum (Al)   | mg/L  | <0.0030               | 0.0041     | 0.0060     | 0.0058     | 0.0067     | <0.0030    | 0.0097                | 0.0085     | 0.0070     | 0.0078     | 0.0580     | 0.0078     | 0.0063              | 0.0047     | 0.0045     | 0.0049     | 0.005      | 0.0045     |
|                  | Antimony (Sb)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Arsenic (As)    | mg/L  | 0.00010               | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Barium (Ba)     | mg/L  | 0.0136                | 0.0145     | 0.0144     | 0.0154     | 0.0144     | 0.0150     | 0.00454               | 0.00809    | 0.00617    | 0.00816    | 0.00800    | 0.00807    | 0.011               | 0.011      | 0.0106     | 0.0107     | 0.0105     | 0.0108     |
|                  | Beryllium (Be)  | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Bismuth (Bi)    | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Boron (B)       | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Cadmium (Cd)    | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Calcium (Ca)    | mg/L  | 30.1                  | 30.4       | 30.0       | 31.1       | 30.6       | 31.8       | 8.11                  | 14.8       | 11.7       | 14.8       | 14.3       | 14.3       | 22.2                | 21.5       | 21.1       | 21.2       | 21.4       | 21.8       |
|                  | Chromium (Cr)   | mg/L  | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                  | Cobalt (Co)     | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Copper (Cu)     | mg/L  | 0.00078               | 0.00126    | 0.00124    | 0.00124    | 0.00125    | 0.00119    | 0.00055               | 0.00091    | 0.00071    | 0.00088    | 0.00089    | 0.00087    | 0.00102             | 0.00096    | 0.00098    | 0.00097    | 0.00095    | 0.00096    |
|                  | Iron (Fe)       | mg/L  | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | 0.049                 | 0.013      | 0.010      | 0.014      | 0.011      | 0.012      | <0.030              | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     |
|                  | Lead (Pb)       | mg/L  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050           | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                  | Lithium (Li)    | mg/L  | 0.0013                | 0.0014     | 0.0014     | 0.0013     | 0.0014     | 0.0016     | <0.0010               | 0.0010     | <0.0010    | 0.0010     | 0.0010     | <0.0010    | 0.0013              | 0.0013     | 0.0013     | 0.0013     | 0.0013     | 0.0013     |
|                  | Magnesium (Mg)  | mg/L  | 18.3                  | 19.3       | 18.9       | 20.2       | 19.4       | 19.5       | 4.61                  | 8.29       | 6.62       | 8.34       | 8.13       | 8.21       | 12.7                | 12.7       | 12.9       | 12.8       | 12.9       | 12.5       |
|                  | Manganese (Mn)  | mg/L  | 0.00187               | 0.000444   | 0.000494   | 0.000395   | 0.000501   | 0.000403   | 0.00207               | 0.00074    | 0.00030    | 0.00065    | 0.00080    | 0.00073    | 0.000548            | 0.000448   | 0.000423   | 0.000364   | 0.000464   | 0.000479   |
|                  | Mercury (Hg)    | mg/L  | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                  | Molybdenum (Mo) | mg/L  | 0.000307              | 0.000393   | 0.000383   | 0.000396   | 0.000397   | 0.000393   | 0.000126              | 0.000236   | 0.000180   | 0.000232   | 0.000238   | 0.000233   | 0.00031             | 0.000323   | 0.000311   | 0.000318   | 0.000313   | 0.000306   |
|                  | Nickel (Ni)     | mg/L  | 0.00074               | 0.00077    | 0.00075    | 0.00079    | 0.00075    | 0.00073    | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050            | <0.00050   | <0.00050   | 0.00052    | <0.00050   | <0.00050   |
|                  | Potassium (K)   | mg/L  | 1.32                  | 1.40       | 1.38       | 1.47       | 1.41       | 1.45       | 0.585                 | 0.941      | 0.777      | 0.959      | 0.941      | 0.953      | 1.17                | 1.13       | 1.16       | 1.16       | 1.18       | 1.14       |
|                  | Selenium (Se)   | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Silicon (Si)    | mg/L  | 2.16                  | 1.37       | 1.39       | 1.41       | 1.39       | 1.39       | 0.633                 | 0.635      | 0.553      | 0.615      | 0.615      | 0.633      | 0.700               | 0.710      | 0.720      | 0.700      | 0.700      | 0.700      |
|                  | Silver (Ag)     | mg/L  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                  | Sodium (Na)     | mg/L  | 6.55                  | 6.90       | 6.78       | 7.19       | 6.85       | 6.97       | 1.15                  | 2.87       | 1.98       | 2.80       | 2.74       | 2.75       | 4.43                | 4.38       | 4.46       | 4.40       | 4.39       | 4.38       |
|                  | Strontium (Sr)  | mg/L  | 0.0218                | 0.0225     | 0.0231     | 0.0231     | 0.0226     | 0.0230     | 0.00580               | 0.0117     | 0.00855    | 0.0118     | 0.0115     | 0.0115     | 0.0165              | 0.0165     | 0.0161     | 0.0163     | 0.0163     | 0.0161     |
|                  | Thallium (Tl)   | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Tin (Sn)        | mg/L  | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                  | Titanium (Ti)   | mg/L  | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.00030              | <0.00030   | <0.00030   | <0.00030   | <0.00030   | <0.00030   | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                  | Uranium (U)     | mg/L  | 0.00366               | 0.00480    | 0.00462    | 0.00482    | 0.00470    | 0.00482    | 0.000428              | 0.00147    | 0.000947   | 0.00146    | 0.00145    | 0.00147    | 0.00343             | 0.00343    | 0.00338    | 0.00339    | 0.00346    | 0.00341    |
|                  | Vanadium (V)    | mg/L  | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                  | Zinc (Zn)       | mg/L  | <0.0030               | <0.0030    | <0.0030    | <0.0030    | 0.0082     | <0.0030    | <0.0010               | <0.0010    | <0.0010    | <0.0010    | 0.0016     | <0.0010    | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

**Table C.71: Magnitude of Elevation in Seasonal Average Dissolved Metal Concentrations Between Mary Lake and Reference Lake 3 in 2020, and at Mary Lake Between 2020 and the Baseline Period**

| Dissolved Metal | Mary Lake North Basin    |      |                  |        |      | Mary Lake South Basin    |      |                  |        |      |
|-----------------|--------------------------|------|------------------|--------|------|--------------------------|------|------------------|--------|------|
|                 | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      | 2020 vs Reference Lake 3 |      | 2020 vs Baseline |        |      |
|                 | Summer                   | Fall | Winter           | Summer | Fall | Summer                   | Fall | Winter           | Summer | Fall |
| Aluminum (Al)   | 1.3                      | 1.2  | 0.4              | 1.4    | 1.0  | 1.2                      | 3.1  | 0.5              | 1.3    | 2.8  |
| Antimony (Sb)   | 1.0                      | 1.0  | 0.8              | 0.8    | 1.0  | 1.0                      | 1.0  | 0.8              | 0.8    | 1.0  |
| Arsenic (As)    | 1.0                      | 1.0  | 0.8              | 0.9    | 1.0  | 1.0                      | 1.0  | 0.8              | 0.9    | 1.0  |
| Barium (Ba)     | 1.2                      | 1.7  | 1.6              | 0.8    | 2.4  | 0.7                      | 0.8  | 0.8              | 0.5    | 1.1  |
| Beryllium (Be)  | 0.2                      | 1.0  | 1.0              | 0.3    | 2.1  | 1.0                      | 1.0  | 1.0              | 1.4    | 2.1  |
| Bismuth (Bi)    | 0.1                      | 1.0  | 1.0              | 0.1    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Boron (B)       | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Cadmium (Cd)    | 0.5                      | 1.0  | 0.8              | 0.3    | 1.0  | 1.0                      | 1.0  | 0.8              | 0.5    | 1.0  |
| Calcium (Ca)    | 1.9                      | 3.0  | 1.8              | 0.7    | 1.4  | 1.0                      | 1.1  | 0.8              | 0.4    | 0.5  |
| Chromium (Cr)   | 0.2                      | 1.0  | 1.3              | 0.3    | 2.1  | 1.0                      | 1.0  | 1.3              | 1.7    | 2.1  |
| Cobalt (Co)     | 1.0                      | 1.0  | 0.8              | 0.8    | 1.0  | 1.0                      | 1.0  | 0.8              | 0.8    | 1.0  |
| Copper (Cu)     | 1.2                      | 1.3  | 0.8              | 0.6    | 1.3  | 0.8                      | 0.8  | 0.6              | 0.4    | 0.7  |
| Iron (Fe)       | 0.6                      | 1.0  | 0.9              | 0.6    | 1.8  | 1.0                      | 1.0  | 0.9              | 1.1    | 1.8  |
| Lead (Pb)       | 1.0                      | 1.0  | 1.0              | 0.8    | 1.0  | 1.0                      | 1.0  | 1.0              | 0.8    | 1.0  |
| Lithium (Li)    | 1.0                      | 1.3  | 0.3              | 0.3    | 0.6  | 1.0                      | 1.0  | 0.2              | 0.3    | 0.4  |
| Magnesium (Mg)  | 1.7                      | 2.6  | 1.9              | 0.7    | 1.4  | 1.0                      | 1.0  | 0.8              | 0.4    | 0.6  |
| Manganese (Mn)  | 3.9                      | 3.3  | 0.5              | 0.6    | 0.1  | 2.8                      | 1.8  | 0.3              | 0.4    | 0.1  |
| Mercury (Hg)    | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  | 1.0                      | 1.0  | 0.5              | 0.5    | 0.5  |
| Molybdenum (Mo) | 1.6                      | 2.0  | 1.6              | 0.8    | 1.8  | 1.0                      | 1.1  | 1.0              | 0.5    | 1.0  |
| Nickel (Ni)     | 1.0                      | 1.0  | 1.2              | 0.7    | 0.9  | 1.0                      | 1.0  | 0.8              | 0.7    | 0.9  |
| Potassium (K)   | 1.0                      | 1.2  | 1.7              | 1.0    | 1.5  | 0.6                      | 0.7  | 1.0              | 0.6    | 0.9  |
| Selenium (Se)   | 0.1                      | 1.0  | -                | 0.5    | -    | 1.0                      | 1.0  | -                | -      | -    |
| Silicon (Si)    | 1.3                      | 1.4  | 1.7              | 0.7    | 0.8  | 0.9                      | 0.9  | 0.7              | 0.5    | 0.5  |
| Silver (Ag)     | 1.0                      | 1.0  | 0.2              | 1.8    | 2.5  | 1.0                      | 1.0  | 0.2              | 1.8    | 2.5  |
| Sodium (Na)     | 2.6                      | 4.3  | 4.0              | 1.1    | 2.1  | 1.4                      | 1.6  | 1.3              | 0.6    | 0.8  |
| Strontium (Sr)  | 1.2                      | 2.0  | 2.1              | 0.9    | 1.7  | 0.7                      | 0.9  | 1.1              | 0.5    | 0.7  |
| Thallium (Tl)   | 0.1                      | 1.0  | 1.0              | 0.1    | 2.5  | 1.0                      | 1.0  | 1.0              | 1.4    | 2.5  |
| Tin (Sn)        | 1.0                      | 1.0  | 0.0              | 0.2    | 0.4  | 1.0                      | 1.0  | 0.0              | 0.2    | 0.4  |
| Titanium (Ti)   | 0.0                      | 1.0  | 1.0              | 0.0    | 1.0  | 1.0                      | 1.0  | 1.0              | 1.0    | 1.0  |
| Uranium (U)     | 4.0                      | 10   | 2.3              | 0.6    | 2.3  | 2.2                      | 2.8  | 0.7              | 0.3    | 0.6  |
| Vanadium (V)    | 0.5                      | 1.0  | 0.8              | 0.5    | 1.0  | 1.0                      | 1.0  | 0.8              | 0.9    | 1.0  |
| Zinc (Zn)       | 0.4                      | 1.0  | 2.1              | 0.5    | 1.2  | 1.0                      | 1.1  | 1.9              | 1.3    | 1.3  |

|  |                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference or baseline period value).                 |
|  | Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference or baseline period value).              |
|  | Denotes highly elevated concentration (mean concentration $\geq 10$ times higher than respective mean reference or baseline period value). |
|  | Denotes differences in method detection limit between the 2020 and baseline data, precluding an evaluation of magnitude of elevation.      |

Table C.72: Water Chemistry at Mary Lake South Basin (BLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Winter Sampling Event |            |            |            |            |            |            |            |           |           |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|------------|------------|------------|------------|------------|------------|------------|-----------|-----------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | BL0-05-A              | BL0-05-A   | BL0-05     | BL0-05     | BL0-05-B   | BL0-05-B   | BL0-03     | BL0-03     | BL0-04    | BL0-04    | BL0-09     | BL0-09     | BL0-06     | BL0-06     |
|                        |                                    |         |                                            |                             | bottom                | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom    | surface   | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 21-Apr-20             | 21-Apr-20  | 21-Apr-20  | 21-Apr-20  | 21-Apr-20  | 21-Apr-20  | 19-Apr-20  | 19-Apr-20  | 20-Apr-20 | 20-Apr-20 | 20-Apr-20  | 20-Apr-20  | 20-Apr-20  | 20-Apr-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 123                   | 131        | 125        | 130        | 130        | 133        | 124        | 138        | 123       | 131       | 122        | 132        | 128        | 133        |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.70                  | 7.73       | 7.56       | 7.67       | 7.68       | 7.68       | 7.65       | 7.71       | 7.61      | 7.72      | 7.42       | 7.66       | 7.60       | 7.68       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 65.4                  | 68.1       | 65.5       | 68.2       | 69.5       | 69.4       | 65.2       | 71         | 63.5      | 66.2      | 62.4       | 63.9       | 64.9       | 67.8       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                  | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0      | <2.0      | <2.0       | <2.0       | <2.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 82                    | 95         | 91         | 102        | 91         | 89         | 83         | 96         | 66        | 79        | 73         | 78         | 77         | 82         |
|                        | Turbidity                          | NTU     | -                                          | -                           | <0.10                 | <0.10      | 0.14       | <0.10      | 0.12       | 0.12       | <0.10      | 0.10       | 0.13      | 0.12      | 0.18       | <0.10      | <0.10      | 0.10       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 57                    | 59         | 59         | 60         | 60         | 61         | 56         | 62         | 58        | 62        | 56         | 62         | 59         | 61         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | variable <sup>c</sup>                      | 0.855                       | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010    | <0.010    | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.044                 | 0.049      | 0.051      | 0.048      | 0.042      | 0.050      | 0.043      | 0.052      | 0.057     | 0.068     | 0.079      | 0.046      | 0.050      | 0.051      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050   | <0.0050   | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15      | <0.15      | <0.15      | 0.20       | <0.15      | <0.15      | <0.15      | <0.15     | <0.15     | <0.15      | <0.15      | <0.15      | 0.23       |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 3.00                  | 3.14       | 3.18       | 3.20       | 3.19       | 2.84       | 3.51       | 3.36       | 3.02      | 3.11      | 2.63       | 2.96       | 2.99       | 3.05       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 3.86                  | 4.16       | 3.84       | 4.21       | 3.87       | 4.04       | 3.34       | 3.36       | 3.24      | 3.46      | 3.22       | 3.39       | 3.22       | 3.63       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030   | <0.0030   | <0.0030    | 0.0033     | <0.0030    | <0.0030    |
|                        | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | 0.0023                | 0.0026     | 0.0022     | 0.0025     | 0.0026     | 0.0019     | <0.0010    | <0.0010    | <0.0010   | <0.0010   | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10     | <0.10     | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 4.33                  | 4.63       | 4.36       | 4.60       | 4.64       | 4.70       | 4.35       | 4.96       | 4.34      | 4.67      | 4.47       | 4.63       | 4.48       | 4.69       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 3.73                  | 3.95       | 3.74       | 3.97       | 4.01       | 4.03       | 3.47       | 3.94       | 3.72      | 3.99      | 3.66       | 3.99       | 3.88       | 4.04       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.130                       | 0.0057                | 0.0052     | 0.0064     | 0.0058     | 0.0053     | 0.0088     | 0.0049     | 0.0037     | 0.0060    | 0.0055    | 0.0085     | 0.0053     | 0.0063     | 0.0081     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010  | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010  | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00671               | 0.00739    | 0.00675    | 0.00699    | 0.00694    | 0.00706    | 0.00662    | 0.00698    | 0.00663   | 0.00710   | 0.00706    | 0.00720    | 0.00702    | 0.00731    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050  | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050  | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010    | <0.010    | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010 | <0.000010 | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 12.7                  | 13.0       | 13.0       | 13.1       | 13.6       | 13.3       | 12.4       | 13.6       | 12.4      | 12.7      | 12.3       | 12.6       | 13.0       | 13.6       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050  | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010  | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00072               | 0.00080    | 0.00071    | 0.00074    | 0.00073    | 0.00077    | 0.00078    | 0.00075    | 0.00071   | 0.00074   | 0.00070    | 0.00074    | 0.00075    | 0.00078    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | <0.030                | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030     | <0.030    | <0.030    | <0.030     | <0.030     | <0.030     | <0.030     |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050             | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050 | <0.000050 | <0.000050  | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010   | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 7.73                  | 8.46       | 7.64       | 7.84       | 7.91       | 8.16       | 7.97       | 8.26       | 7.10      | 7.65      | 7.34       | 7.56       | 7.50       | 7.81       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.000413              | 0.000394   | 0.000822   | 0.000322   | 0.000364   | 0.000416   | 0.000521   | 0.00103    | 0.000514  | 0.000318  | 0.000913   | 0.000351   | 0.000398   | 0.000428   |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | 0.0000061 | 0.0000052 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000223              | 0.000230   | 0.000217   | 0.000235   | 0.000243   | 0.000241   | 0.000215   | 0.000228   | 0.000254  | 0.000276  | 0.000230   | 0.000264   | 0.000263   | 0.000275   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050              | 0.00052    | <0.00050   | <0.00050   | <0.00050   | <0.00050   | 0.00052    | <0.00050   | <0.00050  | 0.00051   | <0.00050   | <0.00050   | <0.00050   | 0.00051    |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.79                  | 0.87       | 0.79       | 0.82       | 0.82       | 0.82       | 0.79       | 0.86       | 0.83      | 0.88      | 0.84       | 0.89       | 0.88       | 0.92       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010   | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.58                  | 0.60       | 0.60       | 0.59       | 0.56       | 0.59       | 0.58       | 0.61       | 0.58      | 0.60      | 0.79       | 0.60       | 0.59       | 0.60       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010 | <0.000010 | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.99                  | 2.19       | 1.98       | 2.08       | 2.12       | 2.11       | 2.11       | 2.22       | 2.00      | 2.12      | 2.09       | 2.11       | 2.13       | 2.21       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.0111                | 0.0117     | 0.0112     | 0.0113     | 0.0118     | 0.0120     | 0.0109     | 0.0121     | 0.0106    | 0.0119    | 0.0102     | 0.0116     | 0.0117     | 0.0122     |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010  | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010  | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010    | <0.010    | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00133               | 0.00140    | 0.00129    | 0.00137    | 0.00139    | 0.00141    | 0.00126    | 0.00138    | 0.00131   | 0.00137   | 0.00121    | 0.00139    | 0.00139    | 0.00140    |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.0010               | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010   | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030   | <0.0030   | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Mary Lake.

Table C.72: Water Chemistry at Mary Lake South Basin (BLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Summer Sampling Event |           |           |            |           |              |            |            |            |            |            |            |           |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|-----------------------|-----------|-----------|------------|-----------|--------------|------------|------------|------------|------------|------------|------------|-----------|------------|
|                        |                                    |         |                                            |                             | BL0-05-A              | BL0-05-A  | BL0-05    | BL0-05     | BL0-05-B  | BL0-05-B     | BL0-03     | BL0-03     | BL0-04     | BL0-04     | BL0-09     | BL0-09     | BL0-06    | BL0-06     |
|                        |                                    |         |                                            |                             | bottom                | surface   | bottom    | surface    | bottom    | surface      | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom    | surface    |
|                        |                                    |         |                                            |                             | 01-Aug-20             | 01-Aug-20 | 01-Aug-20 | 01-Aug-20  | 01-Aug-20 | 01-Aug-20    | 31-Jul-20  | 31-Jul-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20  | 01-Aug-20 | 01-Aug-20  |
| Conventionals          | Conductivity (lab)                 | umho/cm | -                                          | -                           | 76.5                  | 76.1      | 76.2      | 77.1       | 79.4      | 93.3         | 73.2       | 78.0       | 73.1       | 79.9       | 70.1       | 78.4       | 78.9      | 79.0       |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.54                  | 7.72      | 7.52      | 7.72       | 7.63      | 7.82         | 7.55       | 7.89       | 7.45       | 7.81       | 7.44       | 7.75       | 7.61      | 7.72       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 32.9                  | 34.6      | 33.8      | 34.3       | 35        | 41.6         | 31.5       | 35.3       | 31.1       | 34.1       | 29.9       | 33.7       | 33.8      | 33.6       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | 2.1                   | <2.0      | 2.1       | <2.0       | 2.1       | 2.5          | 2.1        | <2.0       | 2.5        | <2.0       | 2.2        | <2.0       | 3.0       | <2.0       |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 47                    | 52        | 43        | 48         | 53        | 63           | 38         | 46         | 53         | 53         | 49         | 51         | 47        | 51         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 3.12                  | 1.73      | 1.83      | 1.75       | 3.33      | 4.09         | 1.47       | 1.13       | 1.96       | 1.03       | 1.80       | 1.38       | 1.83      | 1.50       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 40                    | 40        | 44        | 44         | 41        | 55           | 42         | 44         | 39         | 38         | 40         | 45         | 43        | 41         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | variable <sup>c</sup>                      | 0.855                       | <0.010                | <0.010    | <0.010    | <0.010     | <0.010    | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     | 0.010      | <0.010     | <0.010    | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.039                 | 0.021     | 0.024     | 0.021      | 0.039     | 0.043        | 0.025      | <0.020     | <0.10      | <0.10      | 0.030      | 0.020      | <0.020    | 0.022      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050               | <0.0050   | <0.0050   | <0.0050    | <0.0050   | <0.0050      | <0.0050    | <0.0050    | <0.025     | <0.025     | <0.0050    | <0.0050    | <0.0050   | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15                 | <0.15     | <0.15     | <0.15      | <0.15     | <0.15        | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15     | <0.15      |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 2.09                  | 1.95      | 2.24      | 2.11       | 1.39      | 2.28         | 2.06       | 2.36       | 2.68       | 1.90       | 2.50       | 2.65       | 2.46      | 2.57       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.91                  | 3.06      | 2.81      | 3.07       | 3.13      | 3.21         | 2.94       | 2.02       | 2.84       | 3.10       | 2.94       | 3.12       | 3.20      | 3.03       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | 0.0042                | 0.0035    | 0.0051    | <0.0030    | 0.0072    | 0.0047       | 0.0043     | 0.0032     | 0.0072     | 0.0043     | 0.0047     | 0.0049     | 0.0050    | 0.0045     |
|                        | Phenols                            | mg/L    | 0.004 <sup>a</sup>                         | -                           | <0.0010               | <0.0010   | <0.0010   | <0.0010    | <0.0010   | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10                 | <0.10     | <0.10     | <0.10      | <0.10     | <0.10        | <0.10      | <0.10      | <0.50      | <0.50      | <0.10      | <0.10      | <0.10     | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 3.01                  | 2.63      | 2.66      | 2.67       | 2.79      | 3.34         | 2.57       | 2.59       | 2.6        | 3.3        | 2.38       | 2.64       | 2.63      | 2.64       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 1.94                  | 1.86      | 1.84      | 1.81       | 2.00      | 2.46         | 1.51       | 1.60       | 1.7        | 1.9        | 1.68       | 1.81       | 1.83      | 1.84       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.13                        | 0.0887                | 0.0635    | 0.0639    | 0.0700     | 0.114     | <b>0.131</b> | 0.0124     | 0.0391     | 0.0684     | 0.0346     | 0.0743     | 0.0435     | 0.0520    | 0.0512     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010              | <0.00010  | <0.00010  | <0.00010   | <0.00010  | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010              | <0.00010  | <0.00010  | <0.00010   | <0.00010  | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00489               | 0.00453   | 0.00429   | 0.00474    | 0.00507   | 0.00602      | 0.00384    | 0.00465    | 0.00416    | 0.00444    | 0.00449    | 0.00444    | 0.00446   | 0.00482    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00050              | <0.00050  | <0.00050  | <0.00050   | <0.00050  | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050              | <0.00050  | <0.00050  | <0.00050   | <0.00050  | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010                | <0.010    | <0.010    | <0.010     | <0.010    | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010    | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | <0.000010             | <0.000010 | <0.000010 | <0.000010  | <0.000010 | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010 | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.21                  | 7.22      | 6.48      | 6.80       | 7.67      | 8.22         | 6.38       | 7.01       | 6.54       | 6.94       | 6.16       | 6.69       | 7.45      | 6.99       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050              | <0.00050  | <0.00050  | <0.00050   | <0.00050  | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>a</sup>                        | 0.004                       | <0.00010              | <0.00010  | <0.00010  | <0.00010   | <0.00010  | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00064               | 0.00057   | 0.00057   | 0.00060    | 0.00064   | 0.00074      | <0.00050   | 0.00060    | 0.00057    | 0.00056    | 0.00063    | 0.00057    | 0.00056   | 0.00057    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.103                 | 0.061     | 0.057     | 0.066      | 0.095     | 0.110        | <0.030     | 0.041      | 0.074      | 0.042      | 0.074      | 0.052      | 0.051     | 0.052      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | 0.000101              | 0.000061  | 0.000066  | 0.000059   | 0.000107  | 0.000109     | <0.000050  | <0.000050  | 0.000084   | <0.000050  | 0.000080   | 0.000060   | 0.000061  | 0.000053   |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | <0.0010               | <0.0010   | <0.0010   | <0.0010    | <0.0010   | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010    |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.03                  | 4.08      | 3.83      | 4.19       | 4.15      | 4.94         | 4.08       | 4.40       | 3.48       | 4.11       | 3.69       | 4.12       | 3.99      | 4.17       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00269               | 0.00177   | 0.00223   | 0.00197    | 0.00246   | 0.00249      | 0.000527   | 0.00184    | 0.00240    | 0.00175    | 0.00274    | 0.00178    | 0.00171   | 0.00177    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050            | 0.0000051 | 0.0000053 | <0.0000050 | 0.0000063 | <0.0000050   | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | 0.0000052 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000130              | 0.000143  | 0.000114  | 0.000135   | 0.000148  | 0.000193     | 0.0122     | 0.000114   | 0.000121   | 0.000125   | 0.000113   | 0.000132   | 0.000139  | 0.000131   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050              | <0.00050  | <0.00050  | <0.00050   | <0.00050  | <0.00050     | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050  | <0.00050   |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.59                  | 0.57      | 0.54      | 0.58       | 0.60      | 0.72         | 0.53       | 0.58       | 0.50       | 0.55       | 0.54       | 0.56       | 0.54      | 0.58       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010               | <0.0010   | <0.0010   | <0.0010    | <0.0010   | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.57                  | 0.53      | 0.52      | 0.59       | 0.64      | 0.71         | 0.45       | 0.45       | 0.55       | 0.44       | 0.53       | 0.49       | 0.50      | 0.46       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010             | <0.000010 | <0.000010 | <0.000010  | <0.000010 | <0.000010    | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010 | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.26                  | 1.27      | 1.17      | 1.35       | 1.38      | 1.74         | 1.28       | 1.34       | 1.06       | 1.24       | 1.13       | 1.27       | 1.20      | 1.30       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00635               | 0.00644   | 0.00556   | 0.00614    | 0.00708   | 0.00813      | 0.00530    | 0.00584    | 0.00591    | 0.00591    | 0.00555    | 0.00618    | 0.00658   | 0.00609    |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010              | <0.00010  | <0.00010  | <0.00010   | <0.00010  | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010              | <0.00010  | <0.00010  | <0.00010   | <0.00010  | <0.00010     | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010  | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010                | <0.010    | <0.010    | <0.010     | <0.010    | <0.010       | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010    | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.000755              | 0.000721  | 0.000583  | 0.000681   | 0.000864  | 0.00113      | 0.000505   | 0.000642   | 0.000639   | 0.000648   | 0.000574   | 0.000689   | 0.000728  | 0.000686   |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>a</sup>                         | 0.006                       | <0.0010               | <0.0010   | <0.0010   | <0.0010    | <0.0010   | <0.0010      | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010   | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030               | <0.0030   | 0.0136    | <0.0030    | <0.0030   | <0.0030      | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030   | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Mary Lake.

Table C.72: Water Chemistry at Mary Lake South Basin (BLO) Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters             |                                    | Units   | Water Quality Guideline (WQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Fall Sampling Event |            |            |            |            |            |            |            |            |            |            |            |            |            |
|------------------------|------------------------------------|---------|--------------------------------------------|-----------------------------|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                        |                                    |         |                                            |                             | BL0-05-A            | BL0-05-A   | BL0-05     | BL0-05     | BL0-05-B   | BL0-05-B   | BL0-03     | BL0-03     | BL0-04     | BL0-04     | BL0-09     | BL0-09     | BL0-06     | BL0-06     |
|                        |                                    |         |                                            |                             | bottom              | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    | bottom     | surface    |
|                        |                                    |         |                                            |                             | 28-Aug-20           | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  | 28-Aug-20  |
| Conventional           | Conductivity (lab)                 | umho/cm | -                                          | -                           | 89.2                | 88.9       | 87.8       | 87.4       | 88.4       | 88         | 83.3       | 84.1       | 89.1       | 88.2       | 91.1       | 87.8       | 87.9       | 88.4       |
|                        | pH (lab)                           | pH      | 6.5 - 9.0                                  | -                           | 7.76                | 7.78       | 7.81       | 7.75       | 7.78       | 7.79       | 7.73       | 7.75       | 7.76       | 7.76       | 7.7        | 7.75       | 7.73       | 7.39       |
|                        | Hardness (as CaCO <sub>3</sub> )   | mg/L    | -                                          | -                           | 42.2                | 41.5       | 41.9       | 41.5       | 42.6       | 42.3       | 39.5       | 38.9       | 40.1       | 41.0       | 41.3       | 41.0       | 40.6       | 40.8       |
|                        | Total Suspended Solids (TSS)       | mg/L    | -                                          | -                           | <2.0                | 2          | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | <2.0       | 2.0        | <2.0       | <2.0       | 2.0        | 3.2        |
|                        | Total Dissolved Solids (TDS)       | mg/L    | -                                          | -                           | 49                  | 52         | 57         | 57         | 52         | 45         | 46         | 58         | 58         | 56         | 48         | 50         | 52         | 50         |
|                        | Turbidity                          | NTU     | -                                          | -                           | 1.45                | 1.44       | 1.56       | 1.56       | 1.49       | 1.59       | 0.63       | 0.63       | 1.41       | 1.60       | 1.69       | 1.45       | 1.67       | 1.60       |
|                        | Alkalinity (as CaCO <sub>3</sub> ) | mg/L    | -                                          | -                           | 40                  | 38         | 38         | 39         | 38         | 38         | 36         | 37         | 37         | 38         | 39         | 38         | 38         | 40         |
| Nutrients and Organics | Total Ammonia                      | mg/L    | variable <sup>c</sup>                      | 0.855                       | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Nitrate                            | mg/L    | 3                                          | 3                           | 0.038               | 0.037      | 0.036      | 0.051      | 0.041      | 0.054      | <0.020     | 0.027      | 0.054      | 0.039      | 0.084      | 0.036      | 0.05       | 0.038      |
|                        | Nitrite                            | mg/L    | 0.06                                       | 0.06                        | <0.0050             | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    | <0.0050    |
|                        | Total Kjeldahl Nitrogen (TKN)      | mg/L    | -                                          | -                           | <0.15               | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | <0.15      | 0.15       |
|                        | Dissolved Organic Carbon           | mg/L    | -                                          | -                           | 1.75                | 1.83       | 1.72       | 1.69       | 1.88       | 1.82       | 1.89       | 2.03       | 2.18       | 1.86       | 1.84       | 2.18       | 1.81       | 1.66       |
|                        | Total Organic Carbon               | mg/L    | -                                          | -                           | 2.21                | 2.16       | 2.19       | 2.09       | 2.41       | 2.31       | 2.23       | 2.61       | 2.17       | 2.20       | 2.23       | 2.40       | 2.33       | 2.07       |
|                        | Total Phosphorus                   | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.0030             | <0.0030    | 0.0032     | <0.0030    | 0.0041     | 0.0061     | 0.0093     | <0.0030    | 0.0067     | 0.0049     | 0.0031     | 0.0049     | 0.0045     | 0.0124     |
|                        | Phenols                            | mg/L    | 0.004 <sup>d</sup>                         | -                           | 0.0014              | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | 0.0016     | <0.0010    | <0.0010    | 0.0012     | 0.0013     | 0.0013     | <0.0010    |
| Anions                 | Bromide (Br)                       | mg/L    | -                                          | -                           | <0.10               | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      | <0.10      |
|                        | Chloride (Cl)                      | mg/L    | 120                                        | 120                         | 3.40                | 3.39       | 3.33       | 3.37       | 3.37       | 3.39       | 2.99       | 3.00       | 3.35       | 3.47       | 4.43       | 3.35       | 3.38       | 3.37       |
|                        | Sulphate (SO <sub>4</sub> )        | mg/L    | 218 <sup>β</sup>                           | 218                         | 2.40                | 2.41       | 2.34       | 2.39       | 2.41       | 2.64       | 1.77       | 1.76       | 2.35       | 2.44       | 2.74       | 2.37       | 2.37       | 2.38       |
| Total Metals           | Aluminum (Al)                      | mg/L    | 0.100                                      | 0.13                        | 0.0459              | 0.0459     | 0.03       | 0.0432     | 0.0489     | 0.035      | 0.0178     | 0.0165     | 0.0357     | 0.0356     | 0.044      | 0.0502     | 0.0421     | 0.0459     |
|                        | Antimony (Sb)                      | mg/L    | 0.020 <sup>d</sup>                         | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Arsenic (As)                       | mg/L    | 0.005                                      | 0.005                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | 0.00011    | <0.00010   | <0.00010   | <0.00010   |
|                        | Barium (Ba)                        | mg/L    | -                                          | -                           | 0.00523             | 0.0053     | 0.00507    | 0.0052     | 0.00522    | 0.00507    | 0.00441    | 0.00445    | 0.00515    | 0.00529    | 0.00543    | 0.00509    | 0.00504    | 0.00527    |
|                        | Beryllium (Be)                     | mg/L    | 0.011 <sup>d</sup>                         | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Bismuth (Bi)                       | mg/L    | -                                          | -                           | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Boron (B)                          | mg/L    | 1.5                                        | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Cadmium (Cd)                       | mg/L    | 0.00012                                    | 0.00006                     | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Calcium (Ca)                       | mg/L    | -                                          | -                           | 7.97                | 8.07       | 7.95       | 7.93       | 8.08       | 8.00       | 7.51       | 7.52       | 7.98       | 7.95       | 8.27       | 8.08       | 7.93       | 7.91       |
|                        | Chromium (Cr)                      | mg/L    | 0.0089                                     | 0.0089                      | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Cobalt (Co)                        | mg/L    | 0.0009 <sup>d</sup>                        | 0.004                       | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Copper (Cu)                        | mg/L    | 0.002                                      | 0.0024                      | 0.00061             | 0.0006     | 0.00057    | 0.0006     | 0.00059    | 0.00055    | 0.00057    | 0.00053    | 0.00058    | 0.00059    | 0.0007     | 0.0006     | 0.00058    | 0.00062    |
|                        | Iron (Fe)                          | mg/L    | 0.30                                       | 0.326                       | 0.044               | 0.04       | 0.034      | 0.038      | 0.045      | 0.037      | <0.030     | <0.030     | 0.042      | 0.037      | 0.048      | 0.046      | 0.044      | 0.047      |
|                        | Lead (Pb)                          | mg/L    | 0.001                                      | 0.001                       | <0.000050           | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | <0.000050  | 0.00005    | <0.000050  | <0.000050  | <0.000050  |
|                        | Lithium (Li)                       | mg/L    | -                                          | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Magnesium (Mg)                     | mg/L    | -                                          | -                           | 4.91                | 5.03       | 4.93       | 5.08       | 4.97       | 5.01       | 4.64       | 4.72       | 5.03       | 4.92       | 5.23       | 4.96       | 4.81       | 5.02       |
|                        | Manganese (Mn)                     | mg/L    | 0.935 <sup>β</sup>                         | -                           | 0.00124             | 0.00113    | 0.00105    | 0.00108    | 0.00127    | 0.00106    | 0.0011     | 0.000787   | 0.00118    | 0.00112    | 0.00148    | 0.00116    | 0.00126    | 0.00125    |
|                        | Mercury (Hg)                       | mg/L    | 0.000026                                   | -                           | <0.0000050          | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
|                        | Molybdenum (Mo)                    | mg/L    | 0.073                                      | -                           | 0.000171            | 0.000182   | 0.00017    | 0.000179   | 0.000184   | 0.000164   | 0.000144   | 0.000152   | 0.000173   | 0.000177   | 0.000194   | 0.000185   | 0.000166   | 0.000183   |
|                        | Nickel (Ni)                        | mg/L    | 0.025                                      | 0.025                       | <0.00050            | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   | <0.00050   |
|                        | Potassium (K)                      | mg/L    | -                                          | -                           | 0.63                | 0.65       | 0.63       | 0.65       | 0.65       | 0.63       | 0.57       | 0.57       | 0.64       | 0.64       | 0.64       | 0.64       | 0.62       | 0.64       |
|                        | Selenium (Se)                      | mg/L    | 0.001                                      | -                           | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Silicon (Si)                       | mg/L    | -                                          | -                           | 0.51                | 0.50       | 0.47       | 0.53       | 0.49       | 0.48       | 0.43       | 0.46       | 0.48       | 0.48       | 0.53       | 0.51       | 0.47       | 0.50       |
|                        | Silver (Ag)                        | mg/L    | 0.00025                                    | 0.0001                      | <0.000010           | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  | <0.000010  |
|                        | Sodium (Na)                        | mg/L    | -                                          | -                           | 1.63                | 1.62       | 1.60       | 1.65       | 1.57       | 1.61       | 1.49       | 1.46       | 1.65       | 1.59       | 1.64       | 1.63       | 1.59       | 1.63       |
|                        | Strontium (Sr)                     | mg/L    | -                                          | -                           | 0.00709             | 0.00725    | 0.00711    | 0.00709    | 0.00727    | 0.00711    | 0.00626    | 0.00621    | 0.00714    | 0.00713    | 0.0075     | 0.00707    | 0.00698    | 0.00713    |
|                        | Thallium (Tl)                      | mg/L    | 0.0008                                     | 0.0008                      | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Tin (Sn)                           | mg/L    | -                                          | -                           | <0.00010            | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   | <0.00010   |
|                        | Titanium (Ti)                      | mg/L    | -                                          | -                           | <0.010              | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     | <0.010     |
|                        | Uranium (U)                        | mg/L    | 0.015                                      | -                           | 0.00101             | 0.00102    | 0.000984   | 0.000981   | 0.00101    | 0.000974   | 0.000762   | 0.000744   | 0.000994   | 0.000983   | 0.00109    | 0.00102    | 0.000973   | 0.000984   |
|                        | Vanadium (V)                       | mg/L    | 0.006 <sup>d</sup>                         | 0.006                       | <0.0010             | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    | <0.0010    |
|                        | Zinc (Zn)                          | mg/L    | 0.030                                      | 0.030                       | <0.0030             | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    | <0.0030    |

Indicates parameter concentration above applicable Water Quality Guideline.

**BOLD** Indicates parameter concentration above the AEMP benchmark.

Note: "-" indicates no WQG benchmark applicable.

<sup>a</sup> Canadian Water Quality Guideline for the protection of aquatic life (CCME 1987, 1999) except those indicated by α (Ontario Provincial Water Quality Objective [PWQO]; OMOE 1994) and β (British Columbia Water Quality Guideline [BCWQG]; BCMOE 2013). See Table 2.2 for information regarding WQG criteria.

<sup>b</sup> AEMP Water Quality Benchmarks developed by Intrinsik (2013) using baseline water quality data specific to Mary Lake.



Table C.73: Dissolved Metal Concentrations at Mary Lake South Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Winter Sampling Event           |                                  |                               |                                |                                 |                                  |                               |                                |                               |                                |                               |                                |                               |                                |
|------------------|-----------------|-------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|
|                  |                 |       | BL0-05-A<br>bottom<br>21-Apr-20 | BL0-05-A<br>surface<br>21-Apr-20 | BL0-05<br>bottom<br>21-Apr-20 | BL0-05<br>surface<br>21-Apr-20 | BL0-05-B<br>bottom<br>21-Apr-20 | BL0-05-B<br>surface<br>21-Apr-20 | BL0-03<br>bottom<br>19-Apr-20 | BL0-03<br>surface<br>19-Apr-20 | BL0-04<br>bottom<br>20-Apr-20 | BL0-04<br>surface<br>20-Apr-20 | BL0-09<br>bottom<br>20-Apr-20 | BL0-09<br>surface<br>20-Apr-20 | BL0-06<br>bottom<br>20-Apr-20 | BL0-06<br>surface<br>20-Apr-20 |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0081                          | 0.0048                           | 0.0046                        | 0.0051                         | 0.0076                          | 0.0041                           | 0.0037                        | 0.0031                         | 0.0045                        | 0.0038                         | 0.0097                        | 0.0091                         | 0.0060                        | 0.0045                         |
|                  | Antimony (Sb)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Arsenic (As)    | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Barium (Ba)     | mg/L  | 0.00706                         | 0.00726                          | 0.00711                       | 0.00742                        | 0.00750                         | 0.00744                          | 0.00665                       | 0.00762                        | 0.00679                       | 0.00709                        | 0.00708                       | 0.00730                        | 0.00699                       | 0.00721                        |
|                  | Beryllium (Be)  | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Bismuth (Bi)    | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Boron (B)       | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Cadmium (Cd)    | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Calcium (Ca)    | mg/L  | 13.1                            | 13.8                             | 12.9                          | 13.5                           | 13.9                            | 13.8                             | 13.1                          | 14.1                           | 13.2                          | 14.1                           | 13.0                          | 13.2                           | 13.7                          | 14.2                           |
|                  | Chromium (Cr)   | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Cobalt (Co)     | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Copper (Cu)     | mg/L  | 0.00079                         | 0.00082                          | 0.00076                       | 0.00081                        | 0.00084                         | 0.00081                          | 0.00074                       | 0.00080                        | 0.00073                       | 0.00157                        | 0.00081                       | 0.00080                        | 0.00076                       | 0.00076                        |
|                  | Iron (Fe)       | mg/L  | <0.030                          | <0.030                           | <0.030                        | <0.030                         | <0.030                          | <0.030                           | <0.030                        | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         |
|                  | Lead (Pb)       | mg/L  | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                     | 0.000102                       | 0.000055                      | <0.000050                      | <0.000050                     | <0.000050                      |
|                  | Lithium (Li)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Magnesium (Mg)  | mg/L  | 7.93                            | 8.21                             | 8.05                          | 8.37                           | 8.44                            | 8.48                             | 7.89                          | 8.68                           | 7.42                          | 7.53                           | 7.30                          | 7.54                           | 7.48                          | 7.85                           |
|                  | Manganese (Mn)  | mg/L  | 0.000436                        | 0.000302                         | 0.000541                      | 0.000298                       | 0.000328                        | 0.000281                         | 0.000300                      | 0.000847                       | 0.000348                      | 0.000239                       | 0.000696                      | 0.000386                       | 0.000310                      | 0.000306                       |
|                  | Mercury (Hg)    | mg/L  | <0.0000050                      | <0.0000050                       | 0.0000051                     | <0.0000050                     | <0.0000050                      | <0.0000050                       | 0.0000054                     | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     |
|                  | Molybdenum (Mo) | mg/L  | 0.000223                        | 0.000234                         | 0.000229                      | 0.000254                       | 0.000247                        | 0.000252                         | 0.000204                      | 0.000242                       | 0.000253                      | 0.000257                       | 0.000256                      | 0.000258                       | 0.000266                      | 0.000268                       |
|                  | Nickel (Ni)     | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | 0.00053                        | 0.00054                         | 0.00051                          | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | 0.00051                       | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Potassium (K)   | mg/L  | 0.81                            | 0.84                             | 0.81                          | 0.87                           | 0.87                            | 0.87                             | 0.78                          | 0.88                           | 0.84                          | 0.87                           | 0.85                          | 0.91                           | 0.87                          | 0.91                           |
|                  | Selenium (Se)   | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Silicon (Si)    | mg/L  | 0.57                            | 0.59                             | 0.60                          | 0.61                           | 0.60                            | 0.60                             | 0.57                          | 0.63                           | 0.58                          | 0.59                           | 0.78                          | 0.62                           | 0.58                          | 0.59                           |
|                  | Silver (Ag)     | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Sodium (Na)     | mg/L  | 2.07                            | 2.18                             | 2.08                          | 2.20                           | 2.17                            | 2.20                             | 2.03                          | 2.27                           | 2.10                          | 2.14                           | 2.10                          | 2.18                           | 2.08                          | 2.22                           |
|                  | Strontium (Sr)  | mg/L  | 0.0114                          | 0.0118                           | 0.0115                        | 0.0120                         | 0.0121                          | 0.0119                           | 0.0110                        | 0.0119                         | 0.0103                        | 0.0116                         | 0.0104                        | 0.0119                         | 0.0116                        | 0.0120                         |
|                  | Thallium (Tl)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Tin (Sn)        | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Titanium (Ti)   | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Uranium (U)     | mg/L  | 0.00138                         | 0.00143                          | 0.00132                       | 0.00144                        | 0.00145                         | 0.00145                          | 0.00130                       | 0.00146                        | 0.00135                       | 0.00144                        | 0.00127                       | 0.00148                        | 0.00142                       | 0.00147                        |
|                  | Vanadium (V)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Zinc (Zn)       | mg/L  | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                       | <0.0030                        | <0.0030                       | 0.0107                         | <0.0030                       | <0.0030                        |

**Table C.73: Dissolved Metal Concentrations at Mary Lake South Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2020**

| Parameters       |                 | Units | Summer Sampling Event           |                                  |                               |                                |                                 |                                  |                               |                                |                               |                                |                               |                                |                               |                                |
|------------------|-----------------|-------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|
|                  |                 |       | BL0-05-A<br>bottom<br>01-Aug-20 | BL0-05-A<br>surface<br>01-Aug-20 | BL0-05<br>bottom<br>01-Aug-20 | BL0-05<br>surface<br>01-Aug-20 | BL0-05-B<br>bottom<br>01-Aug-20 | BL0-05-B<br>surface<br>01-Aug-20 | BL0-03<br>bottom<br>31-Jul-20 | BL0-03<br>surface<br>31-Jul-20 | BL0-04<br>bottom<br>01-Aug-20 | BL0-04<br>surface<br>01-Aug-20 | BL0-09<br>bottom<br>01-Aug-20 | BL0-09<br>surface<br>01-Aug-20 | BL0-06<br>bottom<br>01-Aug-20 | BL0-06<br>surface<br>01-Aug-20 |
|                  |                 |       |                                 |                                  |                               |                                |                                 |                                  |                               |                                |                               |                                |                               |                                |                               |                                |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0143                          | 0.0132                           | 0.0155                        | 0.0163                         | 0.0126                          | 0.0196                           | 0.0357                        | 0.0111                         | 0.0137                        | 0.0103                         | 0.0141                        | 0.0097                         | 0.0127                        | 0.0119                         |
|                  | Antimony (Sb)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Arsenic (As)    | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Barium (Ba)     | mg/L  | 0.00423                         | 0.00407                          | 0.00414                       | 0.00417                        | 0.00446                         | 0.00545                          | 0.00398                       | 0.00444                        | 0.00394                       | 0.00409                        | 0.00385                       | 0.00406                        | 0.00416                       | 0.00415                        |
|                  | Beryllium (Be)  | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Bismuth (Bi)    | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Boron (B)       | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Cadmium (Cd)    | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Calcium (Ca)    | mg/L  | 6.41                            | 7.03                             | 6.85                          | 6.96                           | 7.14                            | 8.54                             | 6.39                          | 6.71                           | 6.30                          | 6.94                           | 6.00                          | 6.94                           | 6.90                          | 6.72                           |
|                  | Chromium (Cr)   | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Cobalt (Co)     | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Copper (Cu)     | mg/L  | <0.00050                        | 0.00050                          | 0.00051                       | 0.00051                        | 0.00057                         | 0.00111                          | 0.00051                       | 0.00058                        | <0.00050                      | 0.00051                        | <0.00050                      | 0.00051                        | 0.00052                       | 0.00052                        |
|                  | Iron (Fe)       | mg/L  | <0.030                          | <0.030                           | <0.030                        | <0.030                         | <0.030                          | <0.030                           | 0.044                         | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         |
|                  | Lead (Pb)       | mg/L  | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      |
|                  | Lithium (Li)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Magnesium (Mg)  | mg/L  | 4.09                            | 4.14                             | 4.05                          | 4.11                           | 4.18                            | 4.92                             | 3.77                          | 4.51                           | 3.73                          | 4.08                           | 3.63                          | 3.98                           | 4.04                          | 4.09                           |
|                  | Manganese (Mn)  | mg/L  | 0.000621                        | 0.000492                         | 0.000469                      | 0.000469                       | 0.000545                        | 0.000601                         | 0.00239                       | 0.000416                       | 0.000634                      | 0.000362                       | 0.000595                      | 0.000410                       | 0.000422                      | 0.000409                       |
|                  | Mercury (Hg)    | mg/L  | <0.0000050                      | <0.0000050                       | <0.0000050                    | <0.0000050                     | <0.0000050                      | <0.0000050                       | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     |
|                  | Molybdenum (Mo) | mg/L  | 0.000128                        | 0.000145                         | 0.000134                      | 0.000133                       | 0.000148                        | 0.000206                         | 0.000093                      | 0.000109                       | 0.000126                      | 0.000128                       | 0.000110                      | 0.000131                       | 0.000130                      | 0.000132                       |
|                  | Nickel (Ni)     | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Potassium (K)   | mg/L  | 0.55                            | 0.54                             | 0.54                          | 0.55                           | 0.58                            | 0.68                             | 0.49                          | 0.63                           | 0.51                          | 0.53                           | 0.50                          | 0.54                           | 0.55                          | 0.56                           |
|                  | Selenium (Se)   | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Silicon (Si)    | mg/L  | 0.44                            | 0.42                             | 0.42                          | 0.43                           | 0.45                            | 0.49                             | 0.45                          | 0.39                           | 0.43                          | 0.39                           | 0.43                          | 0.40                           | 0.42                          | 0.41                           |
|                  | Silver (Ag)     | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Sodium (Na)     | mg/L  | 1.28                            | 1.27                             | 1.23                          | 1.27                           | 1.40                            | 1.71                             | 1.14                          | 1.36                           | 1.13                          | 1.26                           | 1.07                          | 1.26                           | 1.32                          | 1.27                           |
|                  | Strontium (Sr)  | mg/L  | 0.00581                         | 0.00604                          | 0.00600                       | 0.00599                        | 0.00657                         | 0.00817                          | 0.00538                       | 0.00562                        | 0.00569                       | 0.00609                        | 0.00549                       | 0.00609                        | 0.00599                       | 0.00578                        |
|                  | Thallium (Tl)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Tin (Sn)        | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Titanium (Ti)   | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Uranium (U)     | mg/L  | 0.000642                        | 0.000688                         | 0.000687                      | 0.000682                       | 0.000804                        | 0.00113                          | 0.000596                      | 0.000583                       | 0.000582                      | 0.000661                       | 0.000551                      | 0.000682                       | 0.000658                      | 0.000630                       |
|                  | Vanadium (V)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Zinc (Zn)       | mg/L  | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                       | <0.0030                        | <0.0030                       | <0.0030                        | <0.0030                       | <0.0030                        |



Table C.73: Dissolved Metal Concentrations at Mary Lake South Basin Water Quality Monitoring Stations, Mary River Project CREMP, 2020

| Parameters       |                 | Units | Fall Sampling Event             |                                  |                               |                                |                                 |                                  |                               |                                |                               |                                |                               |                                |                               |                                |
|------------------|-----------------|-------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|---------------------------------|----------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|
|                  |                 |       | BL0-05-A<br>bottom<br>28-Aug-20 | BL0-05-A<br>surface<br>28-Aug-20 | BL0-05<br>bottom<br>28-Aug-20 | BL0-05<br>surface<br>28-Aug-20 | BL0-05-B<br>bottom<br>28-Aug-20 | BL0-05-B<br>surface<br>28-Aug-20 | BL0-03<br>bottom<br>28-Aug-20 | BL0-03<br>surface<br>28-Aug-20 | BL0-04<br>bottom<br>28-Aug-20 | BL0-04<br>surface<br>28-Aug-20 | BL0-09<br>bottom<br>28-Aug-20 | BL0-09<br>surface<br>28-Aug-20 | BL0-06<br>bottom<br>28-Aug-20 | BL0-06<br>surface<br>28-Aug-20 |
| Dissolved Metals | Aluminum (Al)   | mg/L  | 0.0141                          | 0.0169                           | 0.0105                        | 0.0142                         | 0.0144                          | 0.012                            | 0.0063                        | 0.0065                         | 0.0142                        | 0.0175                         | 0.0148                        | 0.016                          | 0.0118                        | 0.0161                         |
|                  | Antimony (Sb)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Arsenic (As)    | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Barium (Ba)     | mg/L  | 0.00508                         | 0.00508                          | 0.00507                       | 0.00488                        | 0.00489                         | 0.00509                          | 0.00442                       | 0.00434                        | 0.00486                       | 0.00499                        | 0.0051                        | 0.00478                        | 0.00505                       | 0.00481                        |
|                  | Beryllium (Be)  | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Bismuth (Bi)    | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Boron (B)       | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Cadmium (Cd)    | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Calcium (Ca)    | mg/L  | 8.11                            | 8.19                             | 8.16                          | 8.04                           | 8.51                            | 8.25                             | 7.74                          | 7.57                           | 7.93                          | 8.14                           | 7.99                          | 8.20                           | 8.06                          | 8.15                           |
|                  | Chromium (Cr)   | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Cobalt (Co)     | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Copper (Cu)     | mg/L  | 0.00054                         | 0.00056                          | 0.0006                        | 0.00057                        | 0.00056                         | 0.00054                          | 0.0005                        | 0.00052                        | 0.00054                       | 0.00057                        | 0.00058                       | 0.00055                        | 0.00056                       | 0.00057                        |
|                  | Iron (Fe)       | mg/L  | <0.030                          | <0.030                           | <0.030                        | <0.030                         | <0.030                          | <0.030                           | <0.030                        | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         | <0.030                        | <0.030                         |
|                  | Lead (Pb)       | mg/L  | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                       | <0.000050                        | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      | <0.000050                     | <0.000050                      |
|                  | Lithium (Li)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Magnesium (Mg)  | mg/L  | 5.33                            | 5.12                             | 5.23                          | 5.20                           | 5.19                            | 5.26                             | 4.91                          | 4.86                           | 4.92                          | 5.02                           | 5.17                          | 4.98                           | 4.97                          | 4.96                           |
|                  | Manganese (Mn)  | mg/L  | 0.000321                        | 0.000327                         | 0.000225                      | 0.000298                       | 0.000193                        | 0.000246                         | 0.000141                      | 0.000182                       | 0.000245                      | 0.000248                       | 0.000205                      | 0.000227                       | 0.00034                       | 0.000208                       |
|                  | Mercury (Hg)    | mg/L  | <0.0000050                      | <0.0000050                       | <0.0000050                    | <0.0000050                     | <0.0000050                      | <0.0000050                       | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     | <0.0000050                    | <0.0000050                     |
|                  | Molybdenum (Mo) | mg/L  | 0.000178                        | 0.000183                         | 0.000179                      | 0.00019                        | 0.000178                        | 0.000183                         | 0.000143                      | 0.000139                       | 0.000181                      | 0.000181                       | 0.000188                      | 0.00018                        | 0.000185                      | 0.000175                       |
|                  | Nickel (Ni)     | mg/L  | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                        | <0.00050                         | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       | <0.00050                      | <0.00050                       |
|                  | Potassium (K)   | mg/L  | 0.66                            | 0.73                             | 0.66                          | 0.73                           | 0.67                            | 0.73                             | 0.58                          | 0.62                           | 0.63                          | 0.73                           | 0.65                          | 0.74                           | 0.66                          | 0.74                           |
|                  | Selenium (Se)   | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Silicon (Si)    | mg/L  | 0.46                            | 0.47                             | 0.45                          | 0.46                           | 0.45                            | 0.47                             | 0.43                          | 0.42                           | 0.44                          | 0.43                           | 0.46                          | 0.44                           | 0.45                          | 0.47                           |
|                  | Silver (Ag)     | mg/L  | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                       | <0.000010                        | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      | <0.000010                     | <0.000010                      |
|                  | Sodium (Na)     | mg/L  | 1.74                            | 1.73                             | 1.71                          | 1.73                           | 1.77                            | 1.71                             | 1.54                          | 1.56                           | 1.65                          | 1.67                           | 1.76                          | 1.63                           | 1.67                          | 1.62                           |
|                  | Strontium (Sr)  | mg/L  | 0.00724                         | 0.00727                          | 0.00715                       | 0.00721                        | 0.00727                         | 0.00709                          | 0.00623                       | 0.00619                        | 0.00707                       | 0.00712                        | 0.00729                       | 0.00711                        | 0.00719                       | 0.00719                        |
|                  | Thallium (Tl)   | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Tin (Sn)        | mg/L  | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                        | <0.00010                         | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       | <0.00010                      | <0.00010                       |
|                  | Titanium (Ti)   | mg/L  | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                          | <0.010                           | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         | <0.010                        | <0.010                         |
|                  | Uranium (U)     | mg/L  | 0.00099                         | 0.000976                         | 0.000962                      | 0.000972                       | 0.000986                        | 0.000955                         | 0.000743                      | 0.000739                       | 0.000949                      | 0.000963                       | 0.00103                       | 0.000973                       | 0.000932                      | 0.000945                       |
|                  | Vanadium (V)    | mg/L  | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                         | <0.0010                          | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        | <0.0010                       | <0.0010                        |
|                  | Zinc (Zn)       | mg/L  | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                         | <0.0030                          | <0.0030                       | <0.0030                        | <0.0030                       | 0.0072                         | <0.0030                       | <0.0030                        | <0.0030                       | <0.0030                        |

**APPENDIX D**

**SEDIMENT QUALITY DATA**

**Table D.1: Deposited Sediment Field Observations and Collection Details at Unnamed Reference Creek<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station   | Visually Assessed Texture Observations | Presence of Silt Precipitate |
|-----------|----------------------------------------|------------------------------|
| REF-CRK-1 | medium (sized) course sand             | none observed                |
| REF-CRK-3 | medium (sized) course sand             | none observed                |
| REF-CRK-5 | medium (sized) course sand             | none observed                |

<sup>a</sup> Deposited sediment samples were collected using a stainless steel spoon.

**Table D.2: Deposited Sediment Total Organic Carbon and Metal Concentrations at Unnamed Reference Creek (REF-CRK), Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Unnamed Reference Creek Station |            |            | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|---------------------------------|------------|------------|-------------------------------|--------------------|----------------|
|                      |       |                      | REF-CRK-B1                      | REF-CRK-B3 | REF-CRK-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | <0.10                           | <0.10      | 0.16       | 0.12                          | 0.035              | 0.020          |
| Aluminum (Al)        | µg/g  | -                    | 482                             | 473        | 797        | 584                           | 185                | 107            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                           | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.13                            | 0.18       | 0.34       | 0.22                          | 0.11               | 0.06           |
| Barium (Ba)          | µg/g  | -                    | 2.18                            | 2.44       | 3.54       | 2.72                          | 0.722              | 0.417          |
| Beryllium (Be)       | µg/g  | -                    | <0.10                           | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                           | <0.20      | <0.20      | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                            | <5.0       | <5.0       | <5.0                          | 0                  | 0              |
| Cadmium (Cd)         | µg/g  | 3.5                  | <0.020                          | <0.020     | <0.020     | <0.020                        | 0                  | 0              |
| Calcium (Ca)         | µg/g  | -                    | 342                             | 358        | 781        | 494                           | 249                | 144            |
| Chromium (Cr)        | µg/g  | 90                   | 1.82                            | 9.25       | 12.3       | 7.79                          | 5.39               | 3.11           |
| Cobalt (Co)          | µg/g  | -                    | 0.350                           | 1.06       | 1.45       | 0.953                         | 0.558              | 0.322          |
| Copper (Cu)          | µg/g  | 197                  | 0.570                           | 0.830      | 2.24       | 1.21                          | 0.899              | 0.519          |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 1,880                           | 14,700     | 20,900     | 12,493                        | 9,700              | 5,600          |
| Lead (Pb)            | µg/g  | 91.3                 | 0.870                           | 1.70       | 1.90       | 1.49                          | 0.546              | 0.315          |
| Lithium (Li)         | µg/g  | -                    | <2.0                            | <2.0       | <2.0       | <2.0                          | 0                  | 0              |
| Magnesium (Mg)       | µg/g  | -                    | 377                             | 322        | 632        | 444                           | 165                | 95             |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 12.3                            | 28.5       | 41.4       | 27.4                          | 14.6               | 8.42           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                         | <0.0050    | <0.0050    | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | <0.10                           | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 0.820                           | 1.79       | 2.66       | 1.76                          | 0.920              | 0.531          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 109                             | 111        | 280        | 167                           | 98                 | 57             |
| Potassium (K)        | µg/g  | -                    | 120                             | 100        | 180        | 133                           | 42                 | 24             |
| Selenium (Se)        | µg/g  | -                    | <0.20                           | <0.20      | <0.20      | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                           | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                             | <50        | <50        | <50                           | 0                  | 0              |
| Strontium (Sr)       | µg/g  | -                    | 1.59                            | 1.80       | 2.62       | 2.00                          | 0.544              | 0.314          |
| Sulphur (S)          | µg/g  | -                    | <1,000                          | <1,000     | <1,000     | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | <0.050                          | <0.050     | <0.050     | <0.050                        | 0                  | 0              |
| Tin (Sn)             | µg/g  | -                    | <2.0                            | <2.0       | <2.0       | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 35.3                            | 84.6       | 130        | 83.3                          | 47.4               | 27.3           |
| Uranium (U)          | µg/g  | -                    | 0.195                           | 0.600      | 0.643      | 0.5                           | 0.25               | 0.14           |
| Vanadium (V)         | µg/g  | -                    | 2.44                            | 21.0       | 27.1       | 16.8                          | 12.8               | 7.4            |
| Zinc (Zn)            | µg/g  | 315                  | <2.0                            | 2.7        | 4.4        | 3.0                           | 1.2                | 0.71           |
| Zirconium (Zr)       | µg/g  | -                    | 1.1                             | 2.5        | 2.8        | 2.1                           | 0.91               | 0.52           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.3: Field Observations of Sediment Properties at Reference Lake 3 (REF-03) Benthic Stations<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station   | Station Depth (m) | Colour and Texture Observations               | Evidence of Anoxia <sup>b</sup>     | Plant or Algal Presence          |
|-----------|-------------------|-----------------------------------------------|-------------------------------------|----------------------------------|
| REF-03-1  | 10.5              | brown silt on top of grey silt                | presence of hydrogen sulphide odour | none observed                    |
| REF-03-2  | 10.6              | grey silt sand                                | presence of hydrogen sulphide odour | sparse macrophytes, sparse algae |
| REF-03-3  | 10.0              | brown grey silt and clay, some sandy material | none detected                       | none observed                    |
| REF-03-4  | 8.5               | brown silt on grey silt                       | presence of hydrogen sulphide odour | sparse algae                     |
| REF-03-5  | 11.0              | brown silt                                    | none detected                       | sparse algae                     |
| REF-03-6  | 20.5              | brown silt                                    | none detected                       | none observed                    |
| REF-03-7  | 23.0              | brown silt                                    | none detected                       | none observed                    |
| REF-03-8  | 19.0              | light brown and orange brown silt             | none detected                       | none observed                    |
| REF-03-9  | 21.0              | brown silt, slightly clay-like                | none detected                       | none observed                    |
| REF-03-10 | 19.5              | brown silt/clay, some red brown silt          | none detected                       | none observed                    |

<sup>a</sup> Sediment particle size and benthic invertebrate community samples were collected using a petite Ponar.

<sup>b</sup> Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

**Table D.4: Observations from Sediment Cores Collected at Reference Lake 3 (REF-03), Mary River Project CREMP, August 2020**

| Sample Station | Station Depth (m) | Station Type | Core Number | Core Length (cm) | Surficial Substrate Texture Description                                                                                      |
|----------------|-------------------|--------------|-------------|------------------|------------------------------------------------------------------------------------------------------------------------------|
| REF-03-1       | 9.0               | Littoral     | 1           | 30.0             | dark brown unconsolidated silt over dark grey fine sand.                                                                     |
|                |                   |              | 2           | 31.0             |                                                                                                                              |
|                |                   |              | 3           | 27.5             |                                                                                                                              |
|                |                   |              | 4           | 34.0             |                                                                                                                              |
| REF-03-6       | 20.0              | Profundal    | 1           | 20.5             | light brown silt and fine sand over dark brown/grey coarse silt and sand.                                                    |
|                |                   |              | 2           | 22.0             |                                                                                                                              |
|                |                   |              | 3           | 11.0             |                                                                                                                              |
|                |                   |              | 4           | 15.0             |                                                                                                                              |
| REF-03-2       | 9.0               | Littoral     | 1           | 37.0             | light brown silt over dark grey fine sand.                                                                                   |
|                |                   |              | 2           | 38.0             |                                                                                                                              |
|                |                   |              | 3           | 35.0             |                                                                                                                              |
|                |                   |              | 4           | 33.0             |                                                                                                                              |
| REF-03-7       | 23.0              | Profundal    | 1           | 12.0             | light brown mixture of fine sand and silt with orange brown floc present, overlying unconsolidated light brown silt.         |
|                |                   |              | 2           | 17.0             |                                                                                                                              |
|                |                   |              | 3           | 19.0             |                                                                                                                              |
|                |                   |              | 4           | 21.0             |                                                                                                                              |
| REF-03-3       | 10.0              | Littoral     | 1           | 25.0             | brown unconsolidated silt-sand fines overlying dark grey fine sand.                                                          |
|                |                   |              | 2           | 26.0             |                                                                                                                              |
|                |                   |              | 3           | 20.0             |                                                                                                                              |
|                |                   |              | 4           | 19.0             |                                                                                                                              |
| REF-03-8       | 18.5              | Profundal    | 1           | 8.0              | brown silt/fine sand (brown) upper layer on top of consolidated light grey sand overlying brown silt/sand.                   |
|                |                   |              | 2           | 19.5             |                                                                                                                              |
|                |                   |              | 3           | 18.5             |                                                                                                                              |
|                |                   |              | 4           | 20.0             |                                                                                                                              |
| REF-03-4       | 8.0               | Littoral     | 1           | 23.0             | light brown silt on top of consolidated dark grey fine sand underlain by light brown silt/sand.                              |
|                |                   |              | 2           | 8.0              |                                                                                                                              |
|                |                   |              | 3           | 16.0             |                                                                                                                              |
|                |                   |              | 4           | 27.5             |                                                                                                                              |
| REF-03-9       | 21.0              | Profundal    | 1           | 10.5             | brown silt, unconsolidated, or red/brown silt with some minor black streaking overlying consolidated grey silt.              |
|                |                   |              | 2           | 9.0              |                                                                                                                              |
|                |                   |              | 3           | 10.0             |                                                                                                                              |
|                |                   |              | 4           | 12.0             |                                                                                                                              |
| REF-03-5       | 11.0              | Littoral     | 1           | 30.5             | brown unconsolidated silt overlying fine grey sand or dark grey silt/sand unconsolidated floc overlying dark grey silt/sand. |
|                |                   |              | 2           | 33.5             |                                                                                                                              |
|                |                   |              | 3           | 26.0             |                                                                                                                              |
|                |                   |              | 4           | 27.0             |                                                                                                                              |
| REF-03-10      | 20.0              | Profundal    | 1           | 9.0              | loose light brown silt overlying consolidated light grey silt.                                                               |
|                |                   |              | 2           | 11.0             |                                                                                                                              |
|                |                   |              | 3           | 14.0             |                                                                                                                              |
|                |                   |              | 4           | 16.0             |                                                                                                                              |

**Table D.5: Statistical Comparison of Substrate Physical Properties between Littoral and Profundal Sediment Stations of Individual Study Lakes, Mary River Project CREMP, August 2020**

| Lake              | Habitat Variable   | Statistical Test Results          |                |                                       |         | Summary Statistics |    |      |                    |                |         |         |
|-------------------|--------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|----|------|--------------------|----------------|---------|---------|
|                   |                    | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Station Type       | N  | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Camp Lake         | Sand (% by weight) | tequal                            | none           | NO                                    | 0.109   | Littoral           | 5  | 65.4 | 20.1               | 9.0            | 41.1    | 85.0    |
|                   |                    |                                   |                |                                       |         | Profundal          | 9  | 41.5 | 26.8               | 8.9            | 17.3    | 86.8    |
|                   | Silt (% by weight) | tequal                            | none           | NO                                    | 0.156   | Littoral           | 5  | 32.1 | 18.2               | 8.2            | 14.2    | 55.1    |
|                   |                    |                                   |                |                                       |         | Profundal          | 9  | 50.6 | 23.6               | 7.9            | 11.8    | 79.2    |
|                   | Clay (% by weight) | M-W                               | rank           | YES                                   | 0.045   | Littoral           | 5  | 2.6  | 2.0                | 0.9            | 1.0     | 5.5     |
|                   |                    |                                   |                |                                       |         | Profundal          | 9  | 7.9  | 4.7                | 1.6            | 1.4     | 14.7    |
|                   | TOC (%)            | tequal                            | none           | NO                                    | 0.888   | Littoral           | 5  | 1.4  | 1.2                | 0.5            | 0.3     | 3.4     |
|                   |                    |                                   |                |                                       |         | Profundal          | 9  | 1.5  | 0.9                | 0.3            | 0.3     | 3.1     |
| Sheardown Lake NW | Sand (% by weight) | tequal                            | log10          | YES                                   | 0.009   | Littoral           | 7  | 40.5 | 24.6               | 9.3            | 20.1    | 93.0    |
|                   |                    |                                   |                |                                       |         | Profundal          | 7  | 17.2 | 9.3                | 3.5            | 8.5     | 35.3    |
|                   | Silt (% by weight) | M-W                               | rank           | YES                                   | 0.038   | Littoral           | 7  | 48.6 | 20.5               | 7.7            | 6.4     | 67.1    |
|                   |                    |                                   |                |                                       |         | Profundal          | 7  | 68.2 | 9.8                | 3.7            | 49.3    | 78.9    |
|                   | Clay (% by weight) | M-W                               | rank           | YES                                   | 0.073   | Littoral           | 7  | 10.9 | 4.7                | 1.8            | 1.0     | 14.8    |
|                   |                    |                                   |                |                                       |         | Profundal          | 7  | 14.6 | 3.3                | 1.2            | 8.8     | 17.2    |
|                   | TOC (%)            | tequal                            | none           | YES                                   | 0.077   | Littoral           | 7  | 2.5  | 1.4                | 0.5            | 0.2     | 4.3     |
|                   |                    |                                   |                |                                       |         | Profundal          | 7  | 1.4  | 0.5                | 0.2            | 0.4     | 2.0     |
| Sheardown Lake SE | Sand (% by weight) | tequal                            | none           | NO                                    | 0.330   | Littoral           | 5  | 11.1 | 6.7                | 3.0            | 5.2     | 21.6    |
|                   |                    |                                   |                |                                       |         | Profundal          | 5  | 15.1 | 5.3                | 2.4            | 8.3     | 20.7    |
|                   | Silt (% by weight) | tequal                            | none           | NO                                    | 0.383   | Littoral           | 5  | 75.0 | 5.5                | 2.5            | 68.9    | 81.5    |
|                   |                    |                                   |                |                                       |         | Profundal          | 5  | 72.2 | 4.0                | 1.8            | 67.5    | 76.6    |
|                   | Clay (% by weight) | tequal                            | none           | NO                                    | 0.590   | Littoral           | 5  | 13.9 | 3.7                | 1.7            | 9.4     | 17.5    |
|                   |                    |                                   |                |                                       |         | Profundal          | 5  | 12.7 | 2.8                | 1.2            | 9.5     | 15.6    |
|                   | TOC (%)            | tequal                            | none           | NO                                    | 0.428   | Littoral           | 5  | 1.4  | 0.8                | 0.4            | 0.4     | 2.3     |
|                   |                    |                                   |                |                                       |         | Profundal          | 5  | 1.1  | 0.6                | 0.2            | 0.2     | 1.6     |
| Mary Lake         | Sand (% by weight) | tequal                            | log10          | NO                                    | 0.839   | Littoral           | 4  | 28.1 | 34.5               | 17.2           | 5.2     | 78.6    |
|                   |                    |                                   |                |                                       |         | Profundal          | 11 | 21.6 | 24.7               | 7.4            | 2.3     | 91.9    |
|                   | Silt (% by weight) | M-W                               | rank           | NO                                    | 0.851   | Littoral           | 4  | 53.6 | 24.0               | 12.0           | 18.0    | 69.9    |
|                   |                    |                                   |                |                                       |         | Profundal          | 11 | 54.9 | 18.6               | 5.6            | 6.0     | 73.4    |
|                   | Clay (% by weight) | tequal                            | none           | NO                                    | 0.458   | Littoral           | 4  | 18.3 | 14.5               | 7.2            | 3.4     | 32.0    |
|                   |                    |                                   |                |                                       |         | Profundal          | 11 | 23.5 | 10.6               | 3.2            | 2.1     | 33.2    |
|                   | TOC (%)            | tequal                            | none           | NO                                    | 0.796   | Littoral           | 4  | 0.8  | 0.5                | 0.2            | 0.2     | 1.3     |
|                   |                    |                                   |                |                                       |         | Profundal          | 11 | 0.7  | 0.3                | 0.1            | 0.2     | 1.5     |

Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table D.6: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Reference Lake 3 (REF-03) Sediment Stations, Mary River Project CREMP, August 2020**

| Parameter  |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | Reference Lake 3 Station |                      |                     |                      |                     |                      |                     |                      |                     |                       | Study Area Summary Statistics |                    |                |
|------------|----------------------|-------|-----------------------------------------------|--------------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|-----------------------|-------------------------------|--------------------|----------------|
|            |                      |       |                                               | REF-03-1 (littoral)      | REF-03-6 (profundal) | REF-03-2 (littoral) | REF-03-7 (profundal) | REF-03-3 (littoral) | REF-03-8 (profundal) | REF-03-4 (littoral) | REF-03-9 (profundal) | REF-03-5 (littoral) | REF-03-10 (profundal) | Mean                          | Standard Deviation | Standard Error |
| Non-metals | Sand                 | %     | -                                             | 40.4                     | 56.6                 | 23.4                | 13.9                 | 24.7                | 55.3                 | 34.5                | 15.2                 | 24.8                | 16.8                  | 30.6                          | 15.7               | 4.97           |
|            | Silt                 | %     | -                                             | 53.4                     | 36.9                 | 68.4                | 71.9                 | 61.9                | 38.4                 | 59.3                | 71.8                 | 68.2                | 68.1                  | 59.8                          | 13.05              | 4.13           |
|            | Clay                 | %     | -                                             | 6.3                      | 6.5                  | 8.2                 | 14.2                 | 13.4                | 6.3                  | 6.2                 | 13.0                 | 7.0                 | 15.1                  | 9.6                           | 3.79               | 1.198          |
|            | Moisture             | %     | -                                             | 90.0                     | 78.3                 | 92.3                | 86.6                 | 87.9                | 79.4                 | 80.2                | 84.9                 | 89.2                | 84.0                  | 85.3                          | 4.79               | 1.51           |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | 6.95                     | 2.20                 | 6.54                | 4.30                 | 3.71                | 2.36                 | 2.26                | 4.52                 | 4.54                | 3.71                  | 4.11                          | 1.66               | 0.525          |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | 15,400                   | 19,000               | 18,200              | 24,700               | 19,300              | 20,400               | 16,200              | 22,300               | 15,300              | 22,600                | 19,340                        | 3,204              | 1,013          |
|            | Antimony (Sb)        | mg/kg | -                                             | <0.10                    | <0.10                | <0.10               | <0.10                | <0.10               | <0.10                | <0.10               | <0.10                | <0.10               | <0.10                 | <0.10                         | 0                  | 0              |
|            | Arsenic (As)         | mg/kg | 17                                            | 4.73                     | 3.66                 | 4.36                | 4.65                 | 3.67                | 3.76                 | 2.78                | 4.03                 | 2.10                | 4.24                  | 3.80                          | 0.82               | 0.261          |
|            | Barium (Ba)          | mg/kg | -                                             | 139                      | 98.4                 | 134                 | 143                  | 99.7                | 108                  | 88.4                | 129                  | 124                 | 132                   | 120                           | 19.3               | 6.10           |
|            | Beryllium (Be)       | mg/kg | -                                             | 0.59                     | 0.68                 | 0.74                | 0.93                 | 0.69                | 0.77                 | 0.65                | 0.80                 | 0.56                | 0.84                  | 0.73                          | 0.11               | 0.036          |
|            | Bismuth (Bi)         | mg/kg | -                                             | <0.20                    | <0.20                | <0.20               | <0.20                | <0.20               | <0.20                | <0.20               | <0.20                | <0.20               | <0.20                 | <0.20                         | 0                  | 0              |
|            | Boron (B)            | mg/kg | -                                             | 11.6                     | 11.9                 | 13.1                | 16.8                 | 13.2                | 14.5                 | 11.7                | 15.1                 | 11.5                | 15.0                  | 13.4                          | 1.84               | 0.580          |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 0.246                    | 0.128                | 0.184               | 0.175                | 0.120               | 0.144                | 0.163               | 0.142                | 0.150               | 0.150                 | 0.160                         | 0.0359             | 0.0114         |
|            | Calcium (Ca)         | mg/kg | -                                             | 6,080                    | 4,410                | 7,440               | 5,480                | 4,820               | 4,830                | 4,190               | 5,180                | 5,510               | 5,150                 | 5,309                         | 930                | 294            |
|            | Chromium (Cr)        | mg/kg | 90                                            | 54.9                     | 57.1                 | 57.4                | 73.0                 | 59.4                | 59.3                 | 48.6                | 68.5                 | 51.3                | 67.3                  | 59.7                          | 7.75               | 2.45           |
|            | Cobalt (Co)          | mg/kg | -                                             | 10.8                     | 13.2                 | 9.86                | 17.2                 | 12.8                | 14.1                 | 11.8                | 15.6                 | 8.59                | 15.8                  | 13.0                          | 2.77               | 0.88           |
|            | Copper (Cu)          | mg/kg | 197                                           | 80.0                     | 68.8                 | 89.7                | 97.6                 | 72.2                | 77.5                 | 59.8                | 86.1                 | 55.3                | 89.2                  | 77.6                          | 13.7               | 4.32           |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 83,200                   | 39,600               | 68,900              | 51,100               | 41,400              | 42,100               | 38,000              | 45,700               | 21,500              | 46,900                | 47,840                        | 17,136             | 5,419          |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 13.7                     | 14.2                 | 14.3                | 19.1                 | 14.8                | 15.8                 | 12.9                | 17.2                 | 13.1                | 17.1                  | 15.2                          | 2.03               | 0.64           |
|            | Lithium (Li)         | mg/kg | -                                             | 23.2                     | 29.3                 | 26.3                | 38.8                 | 29.6                | 30.6                 | 26.8                | 34.4                 | 24.1                | 35.5                  | 29.9                          | 5.09               | 1.61           |
|            | Magnesium (Mg)       | mg/kg | -                                             | 11,600                   | 12,500               | 11,800              | 16,000               | 12,500              | 13,000               | 10,400              | 14,800               | 10,900              | 14,600                | 12,810                        | 1,811              | 573            |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 578                      | 909                  | 413                 | 1,250                | 790                 | 1,010                | 866                 | 1,820                | 246                 | 1,160                 | 904                           | 451                | 143            |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.0730                   | 0.0391               | 0.0594              | 0.0689               | 0.0396              | 0.0497               | 0.0269              | 0.0806               | 0.0511              | 0.0530                | 0.0541                        | 0.0167             | 0.0053         |
|            | Molybdenum (Mo)      | mg/kg | -                                             | 6.77                     | 2.74                 | 8.95                | 2.86                 | 2.87                | 2.40                 | 2.74                | 2.19                 | 0.87                | 2.42                  | 3.48                          | 2.43               | 0.770          |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 44.5                     | 39.5                 | 41.7                | 50.9                 | 40.4                | 41.6                 | 38.5                | 47.3                 | 35.1                | 45.7                  | 42.5                          | 4.64               | 1.47           |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,700                    | 888                  | 1,470               | 1,000                | 963                 | 959                  | 810                 | 933                  | 892                 | 999                   | 1,061                         | 287                | 91             |
|            | Potassium (K)        | mg/kg | -                                             | 3,560                    | 4,660                | 4,280               | 6,030                | 4,760               | 4,940                | 4,040               | 5,590                | 3,860               | 5,470                 | 4,719                         | 805                | 255            |
|            | Selenium (Se)        | mg/kg | -                                             | 1.02                     | 0.40                 | 1.09                | 0.68                 | 0.58                | 0.55                 | 0.42                | 0.89                 | 0.53                | 0.55                  | 0.67                          | 0.24               | 0.077          |
|            | Silver (Ag)          | mg/kg | -                                             | 0.17                     | 0.12                 | 0.21                | 0.26                 | 0.12                | 0.18                 | <0.10               | 0.25                 | 0.11                | 0.20                  | 0.17                          | 0.058              | 0.018          |
|            | Sodium (Na)          | mg/kg | -                                             | 283                      | 299                  | 315                 | 413                  | 332                 | 347                  | 259                 | 421                  | 332                 | 366                   | 337                           | 52                 | 17             |
|            | Strontium (Sr)       | mg/kg | -                                             | 11.7                     | 10.5                 | 14.3                | 13.8                 | 11.3                | 11.8                 | 9.64                | 12.9                 | 11.0                | 12.6                  | 12.0                          | 1.46               | 0.461          |
|            | Sulphur (S)          | mg/kg | -                                             | 1,700                    | <1,000               | 1,900               | 1,300                | 1,300               | <1,000               | <1,000              | 1,400                | 1,100               | <1,000                | 1,270                         | 320                | 101            |
|            | Thallium (Tl)        | mg/kg | -                                             | 0.373                    | 0.470                | 0.402               | 0.714                | 0.437               | 0.535                | 0.355               | 0.637                | 0.330               | 0.614                 | 0.487                         | 0.132              | 0.0418         |
|            | Tin (Sn)             | mg/kg | -                                             | <2.0                     | <2.0                 | <2.0                | <2.0                 | <2.0                | <2.0                 | <2.0                | <2.0                 | <2.0                | <2.0                  | <2.0                          | 0                  | 0              |
|            | Titanium (Ti)        | mg/kg | -                                             | 936                      | 1,070                | 866                 | 1,190                | 1,030               | 1,100                | 1,050               | 1,170                | 1,150               | 1,150                 | 1,071                         | 105                | 33             |
|            | Uranium (U)          | mg/kg | -                                             | 14.3                     | 15.5                 | 12.5                | 24.2                 | 10.3                | 19.5                 | 9.85                | 16.7                 | 8.13                | 22.8                  | 15.4                          | 5.48               | 1.73           |
|            | Vanadium (V)         | mg/kg | -                                             | 52.4                     | 57.7                 | 61.7                | 70.2                 | 57.2                | 60.0                 | 51.3                | 63.4                 | 47.9                | 65.7                  | 58.8                          | 6.90               | 2.18           |
|            | Zinc (Zn)            | mg/kg | 315                                           | 71.3                     | 73.7                 | 85.7                | 96.4                 | 74.8                | 79.3                 | 67.9                | 82.9                 | 65.8                | 86.7                  | 78.5                          | 9.56               | 3.02           |
|            | Zirconium (Zr)       | mg/kg | -                                             | 4.4                      | 3.9                  | 4.9                 | 4.2                  | 3.3                 | 3.5                  | 3.9                 | 3.8                  | 6.0                 | 4.3                   | 4.2                           | 0.78               | 0.25           |

 Indicates parameter concentration above Sediment Quality Guideline (SQG).

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life probable effects level (PEL; CCME 2015) except α (Ontario Provincial Sediment Quality Guideline [PSQO] severe effect level [SEL]; OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG], probable effects level [PEL; BCMOE 2015]).



**Table D.7: Deposited Sediment Field Sampling Observations from Camp Lake Tributary 1 and Camp Lake Tributary 2<sup>a</sup>, Mary River Project CREMP, August 2020**

| Study Area                                                         | Station   | Texture of Collected Sediment | Silt Presence <sup>b</sup>        |
|--------------------------------------------------------------------|-----------|-------------------------------|-----------------------------------|
| <b>Camp Lake Tributary 1 Upstream (North Branch; CLT1 US)</b>      | CLT1 US-1 | medium (sized) coarse sand    | none observed                     |
|                                                                    | CLT1 US-3 | medium (sized) sand           | none observed                     |
|                                                                    | CLT1 US-5 | medium (sized) sand           | none observed                     |
| <b>Camp Lake Tributary 1 Downstream (Lower Main Stem; CLT1 DS)</b> | CLT1 DS-1 | medium (sized) coarse sand    | precipitate and deposits (<1 mm ) |
|                                                                    | CLT1 DS-3 | medium (sized) coarse sand    | precipitate and deposits (<1 mm ) |
|                                                                    | CLT1 DS-5 | medium (sized) coarse sand    | precipitate and deposits (<1 mm ) |
| <b>Camp Lake Tributary 2 Upstream (CLT2 US)</b>                    | CLT2 US-1 | medium (sized) coarse sand    | none observed                     |
|                                                                    | CLT2 US-3 | medium (sized) coarse sand    | none observed                     |
|                                                                    | CLT2 US-5 | medium (sized) coarse sand    | precipitate and deposits (<1 mm ) |
| <b>Camp Lake Tributary 2 Downstream (CLT2 DS)</b>                  | CLT2 DS-1 | medium (sized) coarse sand    | none observed                     |
|                                                                    | CLT2 DS-3 | medium (sized) coarse sand    | none observed                     |
|                                                                    | CLT2 DS-5 | medium (sized) coarse sand    | precipitate and deposits (<1 mm ) |

<sup>a</sup> Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.

<sup>b</sup> Evidence of silt precipitate included fine material present on the surface of in-stream substrate and/or as interstitial deposits not otherwise expected to occur at such habitat.

**Table D.8: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 1 Upstream (CLT1-US) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Camp Lake Tributary 1 Upstream Station |           |           | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|----------------------------------------|-----------|-----------|-------------------------------|--------------------|----------------|
|                      |       |                      | CLT1-US-1                              | CLT1-US-3 | CLT1-US-5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 1.05                                   | 0.94      | 0.66      | 0.88                          | 0.20               | 0.12           |
| Aluminum (Al)        | µg/g  | -                    | 8,010                                  | 7,080     | 7,080     | 7,390                         | 537                | 310            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                  | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.82                                   | 0.58      | 0.67      | 0.69                          | 0.12               | 0.07           |
| Barium (Ba)          | µg/g  | -                    | 21.2                                   | 17.4      | 14.8      | 17.8                          | 3.2                | 1.9            |
| Beryllium (Be)       | µg/g  | -                    | 0.32                                   | 0.27      | 0.26      | 0.28                          | 0.03               | 0.02           |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                  | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | 10.2                                   | 9.2       | 8.5       | 9.3                           | 0.9                | 0.5            |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.056                                  | 0.043     | 0.042     | 0.047                         | 0.008              | 0.005          |
| Calcium (Ca)         | µg/g  | -                    | 2,890                                  | 2,430     | 2,660     | 2,660                         | 230                | 133            |
| Chromium (Cr)        | µg/g  | 90                   | 29.4                                   | 25.7      | 24.9      | 26.7                          | 2.4                | 1.4            |
| Cobalt (Co)          | µg/g  | -                    | 7.36                                   | 6.14      | 5.69      | 6.40                          | 0.86               | 0.50           |
| Copper (Cu)          | µg/g  | 197                  | 35.8                                   | 22.1      | 13.8      | 23.9                          | 11.1               | 6.41           |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 29,300                                 | 18,200    | 21,000    | 22,833                        | 5,773              | 3,333          |
| Lead (Pb)            | µg/g  | 91.3                 | 4.88                                   | 3.86      | 3.66      | 4.13                          | 0.65               | 0.38           |
| Lithium (Li)         | µg/g  | -                    | 11.5                                   | 11.5      | 10.7      | 11.2                          | 0.46               | 0.27           |
| Magnesium (Mg)       | µg/g  | -                    | 8,610                                  | 8,180     | 8,100     | 8,297                         | 274                | 158            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 199                                    | 171       | 132       | 167                           | 34                 | 19             |
| Mercury (Hg)         | µg/g  | 0.486                | 0.0053                                 | <0.0050   | <0.0050   | 0.0051                        | 0.0002             | 0.0001         |
| Molybdenum (Mo)      | µg/g  | -                    | 0.37                                   | 0.30      | 0.21      | 0.29                          | 0.08               | 0.05           |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 20.2                                   | 19.4      | 17.2      | 18.9                          | 1.6                | 0.9            |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 291                                    | 236       | 256       | 261                           | 28                 | 16             |
| Potassium (K)        | µg/g  | -                    | 1,380                                  | 1,260     | 1,140     | 1,260                         | 120                | 69             |
| Selenium (Se)        | µg/g  | -                    | <0.20                                  | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                  | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | 84                                     | 71        | 78        | 78                            | 7                  | 4              |
| Strontium (Sr)       | µg/g  | -                    | 3.04                                   | 2.65      | 2.86      | 2.85                          | 0.195              | 0.113          |
| Sulphur (S)          | µg/g  | -                    | <1,000                                 | <1,000    | <1,000    | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.120                                  | 0.093     | 0.079     | 0.097                         | 0.021              | 0.012          |
| Tin (Sn)             | µg/g  | -                    | <2.0                                   | <2.0      | <2.0      | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 508                                    | 397       | 422       | 442                           | 58                 | 34             |
| Uranium (U)          | µg/g  | -                    | 0.984                                  | 0.914     | 0.795     | 0.898                         | 0.096              | 0.055          |
| Vanadium (V)         | µg/g  | -                    | 27.2                                   | 22.7      | 22.9      | 24.3                          | 2.5                | 1.5            |
| Zinc (Zn)            | µg/g  | 315                  | 21.5                                   | 17.6      | 17.7      | 18.9                          | 2.2                | 1.3            |
| Zirconium (Zr)       | µg/g  | -                    | 2.8                                    | 2.6       | 2.7       | 2.7                           | 0.1                | 0.1            |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except <sup>α</sup> = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and <sup>β</sup> = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.9: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 1 Downstream (CLT1-DS) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Camp Lake Tributary 1<br>Downstream Station |           |           | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|---------------------------------------------|-----------|-----------|-------------------------------|--------------------|----------------|
|                      |       |                      | CLT1-DS-1                                   | CLT1-DS-3 | CLT1-DS-5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.46                                        | 0.70      | 3.55      | 1.57                          | 1.72               | 0.992          |
| Aluminum (Al)        | µg/g  | -                    | 7,160                                       | 4,690     | 5,690     | 5,847                         | 1,242              | 717            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                       | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.73                                        | 0.47      | 0.80      | 0.67                          | 0.17               | 0.10           |
| Barium (Ba)          | µg/g  | -                    | 32.9                                        | 24.1      | 21.5      | 26.2                          | 5.97               | 3.45           |
| Beryllium (Be)       | µg/g  | -                    | 0.28                                        | 0.19      | 0.23      | 0.23                          | 0.045              | 0.026          |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                       | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                                        | <5.0      | 6.4       | 5.5                           | 0.81               | 0.47           |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.052                                       | 0.044     | 0.050     | 0.049                         | 0.0042             | 0.0024         |
| Calcium (Ca)         | µg/g  | -                    | 4,200                                       | 2,610     | 4,300     | 3,703                         | 948                | 547            |
| Chromium (Cr)        | µg/g  | 90                   | 23.7                                        | 13.9      | 25.9      | 21.2                          | 6.39               | 3.69           |
| Cobalt (Co)          | µg/g  | -                    | 6.45                                        | 3.69      | 5.66      | 5.27                          | 1.42               | 0.82           |
| Copper (Cu)          | µg/g  | 197                  | 10.6                                        | 7.27      | 17.0      | 11.6                          | 4.95               | 2.86           |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 24,700                                      | 18,300    | 36,600    | 26,533                        | 9,287              | 5,362          |
| Lead (Pb)            | µg/g  | 91.3                 | 5.24                                        | 3.62      | 8.33      | 5.73                          | 2.39               | 1.38           |
| Lithium (Li)         | µg/g  | -                    | 9.1                                         | 6.4       | 7.8       | 7.8                           | 1.4                | 0.8            |
| Magnesium (Mg)       | µg/g  | -                    | 8,910                                       | 5,460     | 6,360     | 6,910                         | 1,790              | 1,033          |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 327                                         | 183       | 230       | 247                           | 73                 | 42             |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                                     | <0.0050   | 0.0076    | 0.0059                        | 0.0015             | 0.00087        |
| Molybdenum (Mo)      | µg/g  | -                    | 1.18                                        | 1.44      | 0.59      | 1.07                          | 0.44               | 0.25           |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 26.0                                        | 13.1      | 31.1      | 23.4                          | 9.3                | 5.4            |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 197                                         | 176       | 332       | 235                           | 85                 | 49             |
| Potassium (K)        | µg/g  | -                    | 2,900                                       | 2,050     | 1,430     | 2,127                         | 738                | 426            |
| Selenium (Se)        | µg/g  | -                    | <0.20                                       | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                       | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | 100                                         | 63        | 62        | 75                            | 22                 | 13             |
| Strontium (Sr)       | µg/g  | -                    | 3.96                                        | 2.86      | 5.11      | 3.98                          | 1.13               | 0.65           |
| Sulphur (S)          | µg/g  | -                    | <1,000                                      | <1,000    | <1,000    | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.159                                       | 0.102     | 0.105     | 0.122                         | 0.032              | 0.019          |
| Tin (Sn)             | µg/g  | -                    | <2.0                                        | <2.0      | <2.0      | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 462                                         | 342       | 396       | 400                           | 60                 | 35             |
| Uranium (U)          | µg/g  | -                    | 1.52                                        | 1.01      | 2.03      | 1.52                          | 0.51               | 0.29           |
| Vanadium (V)         | µg/g  | -                    | 16.0                                        | 10.8      | 20.7      | 15.8                          | 5.0                | 2.9            |
| Zinc (Zn)            | µg/g  | 315                  | 33.7                                        | 23.2      | 22.1      | 26.3                          | 6.4                | 3.7            |
| Zirconium (Zr)       | µg/g  | -                    | 6.1                                         | 4.2       | 3.7       | 4.7                           | 1.3                | 0.73           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.10: Magnitude of Elevation in Deposited Sediment Metal Concentrations between Camp Lake Tributary Study Areas and Average Lotic Reference Area Data, Mary River Project CREMP, August 2020**

| Parameter            | Units | Reference Area Data       |                              | Camp Lake Tributary 1          |                                | Camp Lake Tributary 2          |                                |
|----------------------|-------|---------------------------|------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|                      |       | Reference Creek (REF-CRK) | Mary River Reference (GO-09) | CLT1-US Magnitude of Elevation | CLT1-DS Magnitude of Elevation | CLT2-US Magnitude of Elevation | CLT2-DS Magnitude of Elevation |
| Total Organic Carbon | %     | 0.12                      | 0.11                         | 7.6                            | 13.5                           | 2.9                            | 2.2                            |
| Aluminum (Al)        | µg/g  | 584                       | 2,757                        | 7.7                            | 6.1                            | 4.7                            | 3.2                            |
| Antimony (Sb)        | µg/g  | <0.10                     | <0.10                        | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Arsenic (As)         | µg/g  | 0.22                      | 0.38                         | 2.5                            | 2.4                            | 2.7                            | 1.7                            |
| Barium (Ba)          | µg/g  | 2.72                      | 12.6                         | 4.0                            | 5.9                            | 3.5                            | 2.2                            |
| Beryllium (Be)       | µg/g  | <0.10                     | 0.14                         | 2.5                            | 2.0                            | 1.6                            | 1.4                            |
| Bismuth (Bi)         | µg/g  | <0.20                     | <0.20                        | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Boron (B)            | µg/g  | <5.0                      | 5.4                          | 1.8                            | 1.0                            | 1.0                            | 1.0                            |
| Cadmium (Cd)         | µg/g  | <0.020                    | <0.020                       | 2.4                            | 2.4                            | 1.5                            | 1.3                            |
| Calcium (Ca)         | µg/g  | 494                       | 2,750                        | 3.2                            | 4.4                            | 6.3                            | 2.6                            |
| Chromium (Cr)        | µg/g  | 7.79                      | 13.6                         | 2.7                            | 2.1                            | 2.2                            | 1.5                            |
| Cobalt (Co)          | µg/g  | 0.953                     | 2.40                         | 4.7                            | 3.9                            | 3.3                            | 2.0                            |
| Copper (Cu)          | µg/g  | 1.21                      | 4.45                         | 12.5                           | 6.1                            | 6.2                            | 3.9                            |
| Iron (Fe)            | µg/g  | 12,493                    | 11,063                       | 1.9                            | 2.3                            | 1.5                            | 1.2                            |
| Lead (Pb)            | µg/g  | 1.49                      | 3.07                         | 2.1                            | 2.9                            | 1.7                            | 1.5                            |
| Lithium (Li)         | µg/g  | <2.0                      | 5.0                          | 3.9                            | 2.7                            | 2.3                            | 1.4                            |
| Magnesium (Mg)       | µg/g  | 444                       | 2,810                        | 10.8                           | 9.0                            | 9.2                            | 5.3                            |
| Manganese (Mn)       | µg/g  | 27.4                      | 75.7                         | 4.2                            | 6.1                            | 3.6                            | 2.5                            |
| Mercury (Hg)         | µg/g  | <0.0050                   | <0.0050                      | 1.0                            | 1.2                            | 1.0                            | 1.0                            |
| Molybdenum (Mo)      | µg/g  | <0.10                     | 0.11                         | 2.8                            | 10.1                           | 3.2                            | 4.5                            |
| Nickel (Ni)          | µg/g  | 1.76                      | 6.11                         | 6.9                            | 8.6                            | 5.6                            | 3.7                            |
| Phosphorus (P)       | µg/g  | 167                       | 350                          | 1.2                            | 1.0                            | 1.1                            | 0.8                            |
| Potassium (K)        | µg/g  | 133                       | 750                          | 5.6                            | 9.4                            | 5.8                            | 4.8                            |
| Selenium (Se)        | µg/g  | <0.20                     | <0.20                        | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Silver (Ag)          | µg/g  | <0.10                     | <0.10                        | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Sodium (Na)          | µg/g  | <50                       | 68                           | 1.3                            | 1.3                            | 1.1                            | 1.0                            |
| Strontium (Sr)       | µg/g  | 2.00                      | 4.72                         | 1.0                            | 1.4                            | 1.4                            | 0.9                            |
| Sulphur (S)          | µg/g  | <1,000                    | <1,000                       | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Thallium (Tl)        | µg/g  | <0.050                    | 0.068                        | 1.7                            | 2.1                            | 1.4                            | 1.2                            |
| Tin (Sn)             | µg/g  | <2.0                      | <2.0                         | 1.0                            | 1.0                            | 1.0                            | 1.0                            |
| Titanium (Ti)        | µg/g  | 83.3                      | 353                          | 3.3                            | 3.0                            | 2.5                            | 1.8                            |
| Uranium (U)          | µg/g  | 0.479                     | 0.922                        | 1.4                            | 2.4                            | 1.2                            | 1.7                            |
| Vanadium (V)         | µg/g  | 16.8                      | 19.5                         | 1.3                            | 0.9                            | 0.9                            | 0.7                            |
| Zinc (Zn)            | µg/g  | 3.03                      | 10.3                         | 4.0                            | 5.6                            | 3.0                            | 3.8                            |
| Zirconium (Zr)       | µg/g  | 2.1                       | 5.8                          | 0.9                            | 1.5                            | 1.2                            | 1.1                            |



Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference creek value).



Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference creek value).



Denotes highly elevated (mean concentration greater than 10 times higher than respective mean reference creek value).

**Table D.11: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 2 Upstream (CLT2-US) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Camp Lake Tributary 2 Upstream Station |            |            | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|----------------------------------------|------------|------------|-------------------------------|--------------------|----------------|
|                      |       |                      | CLT2-US-B1                             | CLT2-US-B3 | CLT2-US-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.24                                   | 0.31       | 0.45       | 0.33                          | 0.11               | 0.015          |
| Aluminum (Al)        | µg/g  | -                    | 3,210                                  | 3,230      | 7,010      | 4,483                         | 2,188              | 301            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                  | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.55                                   | 0.61       | 1.06       | 0.74                          | 0.28               | 0.038          |
| Barium (Ba)          | µg/g  | -                    | 12.0                                   | 12.0       | 23.6       | 15.9                          | 6.70               | 0.920          |
| Beryllium (Be)       | µg/g  | -                    | 0.14                                   | 0.15       | 0.27       | 0.19                          | 0.072              | 0.0099         |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                  | <0.20      | <0.20      | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                                   | <5.0       | 5.9        | 5.3                           | 0.52               | 0.071          |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.029                                  | 0.024      | 0.038      | 0.030                         | 0.0071             | 0.0010         |
| Calcium (Ca)         | µg/g  | -                    | 4,770                                  | 3,670      | 7,390      | 5,277                         | 1,911              | 263            |
| Chromium (Cr)        | µg/g  | 90                   | 19.0                                   | 16.3       | 29.6       | 21.6                          | 7.03               | 0.97           |
| Cobalt (Co)          | µg/g  | -                    | 3.61                                   | 3.37       | 6.38       | 4.45                          | 1.67               | 0.230          |
| Copper (Cu)          | µg/g  | 197                  | 7.11                                   | 13.8       | 14.7       | 11.9                          | 4.15               | 0.570          |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 13,600                                 | 12,700     | 27,900     | 18,067                        | 8,528              | 1,171          |
| Lead (Pb)            | µg/g  | 91.3                 | 2.68                                   | 2.55       | 5.23       | 3.49                          | 1.51               | 0.208          |
| Lithium (Li)         | µg/g  | -                    | 5.1                                    | 5.0        | 9.6        | 6.6                           | 2.6                | 0.36           |
| Magnesium (Mg)       | µg/g  | -                    | 5,640                                  | 5,200      | 10,300     | 7,047                         | 2,826              | 388            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 119                                    | 122        | 189        | 143                           | 40                 | 5.4            |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                                | <0.0050    | <0.0050    | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.16                                   | 0.35       | 0.51       | 0.34                          | 0.18               | 0.024          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 11.9                                   | 10.5       | 23.5       | 15.3                          | 7.14               | 0.980          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 219                                    | 214        | 328        | 254                           | 64                 | 8.8            |
| Potassium (K)        | µg/g  | -                    | 830                                    | 780        | 2,330      | 1,313                         | 881                | 121            |
| Selenium (Se)        | µg/g  | -                    | <0.20                                  | <0.20      | <0.20      | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                  | <0.10      | <0.10      | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | 51                                     | <50        | 87         | 63                            | 21                 | 2.9            |
| Strontium (Sr)       | µg/g  | -                    | 3.37                                   | 3.18       | 5.03       | 3.86                          | 1.018              | 0.140          |
| Sulphur (S)          | µg/g  | -                    | <1,000                                 | <1,000     | <1,000     | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.060                                  | 0.055      | 0.132      | 0.082                         | 0.043              | 0.0059         |
| Tin (Sn)             | µg/g  | -                    | <2.0                                   | <2.0       | <2.0       | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 261                                    | 242        | 506        | 336                           | 147                | 20             |
| Uranium (U)          | µg/g  | -                    | 0.480                                  | 0.460      | 1.29       | 0.743                         | 0.474              | 0.0650         |
| Vanadium (V)         | µg/g  | -                    | 15.9                                   | 12.8       | 20.8       | 16.5                          | 4.03               | 0.55           |
| Zinc (Zn)            | µg/g  | 315                  | 9.40                                   | 9.70       | 22.5       | 13.9                          | 7.48               | 1.03           |
| Zirconium (Zr)       | µg/g  | -                    | 3.3                                    | 2.6        | 5.2        | 3.7                           | 1.3                | 0.18           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except <sup>α</sup> = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and <sup>β</sup> = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.12: Deposited Sediment Total Organic Carbon and Metal Concentrations at Camp Lake Tributary 2 Downstream (CLT2-DS) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Camp Lake Tributary 2 Downstream Station |           |           | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|------------------------------------------|-----------|-----------|-------------------------------|--------------------|----------------|
|                      |       |                      | CLT2-DS-1                                | CLT2-DS-3 | CLT2-DS-5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.48                                     | 0.17      | 0.13      | 0.26                          | 0.19               | 0.026          |
| Aluminum (Al)        | µg/g  | -                    | 3,720                                    | 4,210     | 1,240     | 3,057                         | 1,592              | 219            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                    | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.62                                     | 0.47      | 0.31      | 0.47                          | 0.16               | 0.021          |
| Barium (Ba)          | µg/g  | -                    | 12.0                                     | 12.3      | 4.61      | 9.64                          | 4.36               | 0.598          |
| Beryllium (Be)       | µg/g  | -                    | 0.17                                     | 0.21      | <0.10     | 0.16                          | 0.056              | 0.0076         |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                    | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                                     | <5.0      | <5.0      | <5.0                          | 0                  | 0              |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.024                                    | 0.033     | <0.020    | 0.026                         | 0.0067             | 0.0009         |
| Calcium (Ca)         | µg/g  | -                    | 2,810                                    | 2,540     | 1,220     | 2,190                         | 851                | 117            |
| Chromium (Cr)        | µg/g  | 90                   | 25.7                                     | 12.8      | 7.19      | 15.2                          | 9.49               | 1.30           |
| Cobalt (Co)          | µg/g  | -                    | 3.90                                     | 3.06      | 1.15      | 2.70                          | 1.41               | 0.194          |
| Copper (Cu)          | µg/g  | 197                  | 7.45                                     | 8.40      | 6.54      | 7.46                          | 0.930              | 0.128          |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 20,800                                   | 15,400    | 4,570     | 13,590                        | 8,265              | 1,135          |
| Lead (Pb)            | µg/g  | 91.3                 | 3.31                                     | 3.77      | 2.07      | 3.05                          | 0.879              | 0.121          |
| Lithium (Li)         | µg/g  | -                    | 5.1                                      | 5.3       | <2.0      | 4.1                           | 1.9                | 0.25           |
| Magnesium (Mg)       | µg/g  | -                    | 5,060                                    | 5,460     | 1,700     | 4,073                         | 2,065              | 284            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 131                                      | 131       | 43        | 102                           | 50.8               | 6.98           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                                  | <0.0050   | <0.0050   | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.38                                     | 0.92      | 0.12      | 0.47                          | 0.41               | 0.056          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 14.4                                     | 11.1      | 4.96      | 10.2                          | 4.79               | 0.658          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 232                                      | 198       | 101       | 177                           | 68.0               | 9.34           |
| Potassium (K)        | µg/g  | -                    | 1,020                                    | 1,780     | 430       | 1,077                         | 677                | 93             |
| Selenium (Se)        | µg/g  | -                    | <0.20                                    | <0.20     | <0.20     | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                    | <0.10     | <0.10     | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | 80                                       | <50       | <50       | 60                            | 17                 | 2.4            |
| Strontium (Sr)       | µg/g  | -                    | 3.08                                     | 2.63      | 1.83      | 2.51                          | 0.633              | 0.087          |
| Sulphur (S)          | µg/g  | -                    | <1,000                                   | <1,000    | <1,000    | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.070                                    | 0.091     | <0.050    | 0.070                         | 0.021              | 0.0028         |
| Tin (Sn)             | µg/g  | -                    | <2.0                                     | <2.0      | <2.0      | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 308                                      | 317       | 120       | 248                           | 111                | 15             |
| Uranium (U)          | µg/g  | -                    | 1.25                                     | 1.31      | 0.708     | 1.09                          | 0.332              | 0.0455         |
| Vanadium (V)         | µg/g  | -                    | 22.4                                     | 10.1      | 5.60      | 12.7                          | 8.70               | 1.19           |
| Zinc (Zn)            | µg/g  | 315                  | 22.9                                     | 22.0      | 8.10      | 17.7                          | 8.30               | 1.140          |
| Zirconium (Zr)       | µg/g  | -                    | 3.4                                      | 5.0       | 1.8       | 3.4                           | 1.6                | 0.22           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.13: Field Observations of Sediment Properties at Camp Lake (JLO) Benthic Stations<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station | Station Depth (m) | Colour and Texture Observations                                                    | Evidence of Anoxia <sup>b</sup> | Plant or Algal Presence |
|---------|-------------------|------------------------------------------------------------------------------------|---------------------------------|-------------------------|
| JLO-02  | 11.0              | dark grey silt, red brown silt on top, contains organics                           | none detected                   | sparse algae            |
| JLO-01  | 18.0              | light brown silt                                                                   | none detected                   | sparse algae            |
| JLO-21  | 10.0              | dark brown silt                                                                    | none detected                   | sparse algae            |
| JLO-20  | 7.0               | grey-brown silt-sand mixture                                                       | none detected                   | sparse algae            |
| JLO-19  | 7.5               | thick brown silt layer over dark grey fine silt-sand mixture                       | none detected                   | sparse algae            |
| JLO-07  | 33.0              | thin layer of silt overlying grey, very fine sand                                  | none detected                   | sparse algae            |
| JLO-18  | 12.0              | dark grey organics (roots) mixed in with silt and sand                             | some hydrogen sulphide odour    | sparse algae            |
| JLO-16  | 16.0              | thin layer of silt overlying grey fine sand                                        | none detected                   | sparse algae            |
| JLO-11  | 28.5              | grey-brown fine sand mixed with some silt overlying degraded organics              | some hydrogen sulphide odour    | sparse algae            |
| JLO-12  | 17.0              | brown sand overlying grey sand; some black streaking between brown and grey layers | some blackened substrate        | none observed           |

<sup>a</sup> Sediment particle size and benthic invertebrate community samples were collected using a petite-Ponar.

<sup>b</sup> Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

**Table D.14: Observations from Sediment Cores Collected at Camp Lake (JLO), Mary River Project CREMP, August 2020**

| Sample Station | Station Depth (m) | Station Type | Core Number | Core Length (cm) | Surficial Substrate Texture Description                                                                                                                                    |
|----------------|-------------------|--------------|-------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| JLO-02         | 11.0              | Littoral     | 1           | 19.5             | light floc of light reddish brown silt overlying grey sandy material; no black streaking                                                                                   |
|                |                   |              | 2           | 19.5             |                                                                                                                                                                            |
|                |                   |              | 3           | 17.0             |                                                                                                                                                                            |
|                |                   |              | 4           | 16.5             |                                                                                                                                                                            |
| JLO-01         | 17.7              | Profundal    | 1           | 15.5             | black-brown silt floc (some speckling in second core) over light brown slightly consolidated silt and consolidated brown silt                                              |
|                |                   |              | 2           | 11.5             |                                                                                                                                                                            |
|                |                   |              | 3           | 11.5             |                                                                                                                                                                            |
|                |                   |              | 4           | 12.0             |                                                                                                                                                                            |
| JLO-14         | 26.5              | Profundal    | 1           | 6.0              | light brown silt floc over consolidated brown silt and grey sandy material (core 3 and 4 had black streaking between brown and grey layer)                                 |
|                |                   |              | 2           | 20.0             |                                                                                                                                                                            |
|                |                   |              | 3           | 14.0             |                                                                                                                                                                            |
|                |                   |              | 4           | 10.0             |                                                                                                                                                                            |
| JLO-17         | 15.6              | Profundal    | 1           | 14.5             | unconsolidated light brown silt over consolidated grey fine sand; no dark streaking                                                                                        |
|                |                   |              | 2           | 13.0             |                                                                                                                                                                            |
|                |                   |              | 3           | 13.5             |                                                                                                                                                                            |
|                |                   |              | 4           | 17.0             |                                                                                                                                                                            |
| JLO-07         | 33.1              | Profundal    | 1           | 11.5             | light brown unconsolidated silt floc overlying consolidated dark grey sand (some dark brown sand mixed) and variegated unconsolidated brown silt or consolidated grey sand |
|                |                   |              | 2           | 16.0             |                                                                                                                                                                            |
|                |                   |              | 3           | 17.0             |                                                                                                                                                                            |
|                |                   |              | 4           | 14.0             |                                                                                                                                                                            |
| JLO-16         | 16.2              | Profundal    | 1           | 4.5              | light brown silt floc over consolidated grey sand with some light brown silt                                                                                               |
|                |                   |              | 2           | 6.5              |                                                                                                                                                                            |
|                |                   |              | 3           | 5.0              |                                                                                                                                                                            |
|                |                   |              | 4           | 4.5              |                                                                                                                                                                            |
| JLO-15         | 17.0              | Profundal    | 1           | 11.0             | unconsolidated brown silt overlying consolidated brown silt mixed with fine grey sand; black streaking associated with brown silt layer                                    |
|                |                   |              | 2           | 12.0             |                                                                                                                                                                            |
|                |                   |              | 3           | 10.5             |                                                                                                                                                                            |
|                |                   |              | 4           | 11.5             |                                                                                                                                                                            |
| JLO-11         | 29.0              | Profundal    | 1           | 8.5              | unconsolidated fine light brown silt over consolidated grey sand; some black streaking                                                                                     |
|                |                   |              | 2           | 14.0             |                                                                                                                                                                            |
|                |                   |              | 3           | 11.0             |                                                                                                                                                                            |
|                |                   |              | 4           | 14.5             |                                                                                                                                                                            |
| JLO-13         | 17.0              | Profundal    | 1           | 13.5             | unconsolidated light brown fine silt over consolidated light brown fine silt                                                                                               |
|                |                   |              | 2           | 7.0              |                                                                                                                                                                            |
|                |                   |              | 3           | 15.0             |                                                                                                                                                                            |
|                |                   |              | 4           | 10.0             |                                                                                                                                                                            |
| JLO-12         | 17.0              | Profundal    | 1           | 5.0              | thin (<1 mm) layer of brown silt overlying consolidated light brown coarse sand, or consolidated light grey coarse sand; some black streaking present                      |
|                |                   |              | 2           | 5.5              |                                                                                                                                                                            |
|                |                   |              | 3           | 5.5              |                                                                                                                                                                            |
|                |                   |              | 4           | 4.5              |                                                                                                                                                                            |



**Table D.15: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Camp Lake (JLO) Sediment Stations, Mary River Project CREMP, August 2020**

| Parameter  |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Camp Lake Stations |                    |                    |                    |                    |                    |                    |                    |                    |                    | Summary Statistics |                    |
|------------|----------------------|-------|-----------------------------------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|            |                      |       |                                               |                             | JLO-02 (littoral)  | JLO-01 (profundal) | JLO-14 (profundal) | JLO-17 (profundal) | JLO-07 (profundal) | JLO-16 (profundal) | JLO-15 (profundal) | JLO-11 (profundal) | JLO-13 (profundal) | JLO-12 (profundal) | Mean               | Standard Deviation |
| Non-metals | Sand                 | %     | -                                             | -                           | 46.5               | 27.6               | 20.8               | 17.3               | 18.3               | 86.8               | 42.2               | 47.8               | 29.3               | 83.4               | 42.0               | 25.3               |
|            | Silt                 | %     | -                                             | -                           | 48.0               | 62.9               | 64.5               | 79.2               | 69.4               | 11.8               | 49.5               | 42.9               | 60.4               | 14.9               | 50.4               | 22.3               |
|            | Clay                 | %     | -                                             | -                           | 5.5                | 9.6                | 14.7               | 3.4                | 12.3               | 1.4                | 8.3                | 9.3                | 10.3               | 1.7                | 7.65               | 4.50               |
|            | Moisture             | %     | -                                             | -                           | 81.7               | 73.6               | 75.4               | 70.3               | 74.4               | 26.4               | 59.2               | 63.8               | 71.9               | 38.8               | 63.6               | 17.7               |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | -                           | 3.39               | 1.83               | 1.99               | 2.03               | 3.13               | 0.26               | 1.18               | 1.33               | 1.52               | 0.33               | 1.70               | 1.03               |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | -                           | 15,500             | 19,800             | 19,400             | 15,200             | 19,300             | 5,070              | 16,100             | 17,900             | 18,700             | 6,260              | 15,323             | 5,359              |
|            | Antimony (Sb)        | mg/kg | -                                             | -                           | 0.11               | 0.10               | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | 0.10               | 0.0032             |
|            | Arsenic (As)         | mg/kg | 17                                            | 5.9                         | <b>9.03</b>        | 5.61               | <b>6.82</b>        | <b>16.6</b>        | 3.49               | 1.00               | 3.90               | 4.99               | 5.22               | 2.21               | 5.89               | 4.40               |
|            | Barium (Ba)          | mg/kg | -                                             | -                           | 122                | 80.3               | 83.1               | 222                | 73.6               | 20.6               | 57.9               | 96.5               | 71.2               | 39.5               | 86.7               | 55.3               |
|            | Beryllium (Be)       | mg/kg | -                                             | -                           | 0.78               | 1.06               | 1.10               | 0.90               | 1.07               | 0.26               | 0.82               | 0.91               | 1.08               | 0.31               | 0.83               | 0.31               |
|            | Bismuth (Bi)         | mg/kg | -                                             | -                           | 0.29               | 0.31               | 0.34               | 0.28               | 0.35               | <0.20              | 0.23               | 0.25               | 0.27               | <0.20              | 0.27               | 0.053              |
|            | Boron (B)            | mg/kg | -                                             | -                           | 17.8               | 34.2               | 34.6               | 22.6               | 30.9               | 7.6                | 19.9               | 28.5               | 32.7               | 9.3                | 23.8               | 10.0               |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 1.5                         | 0.269              | 0.206              | 0.204              | 0.183              | 0.268              | 0.041              | 0.151              | 0.166              | 0.167              | 0.045              | 0.17               | 0.078              |
|            | Calcium (Ca)         | mg/kg | -                                             | -                           | 5,650              | 5,010              | 5,120              | 5,290              | 5,860              | 10,600             | 3,770              | 4,120              | 4,500              | 1,830              | 5,175              | 2,234              |
|            | Chromium (Cr)        | mg/kg | 90                                            | 98                          | 66.2               | 81.3               | 82.9               | 66.9               | 79.9               | 33.3               | 65.9               | 70.7               | 72.5               | 28.4               | 64.8               | 19.0               |
|            | Cobalt (Co)          | mg/kg | -                                             | -                           | 18.4               | 19.2               | 20.8               | 22.0               | 17.9               | 6.05               | 16.2               | 18.3               | 18.5               | 7.63               | 16.5               | 5.34               |
|            | Copper (Cu)          | mg/kg | 197                                           | 50                          | 49.9               | 49.7               | <b>51.5</b>        | 42.2               | <b>61.6</b>        | 12.6               | 38.7               | 43.8               | 44.4               | 12.1               | 40.7               | 16.2               |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 52,400                      | <b>61,000</b>      | 39,300             | <b>52,500</b>      | <b>63,100</b>      | 34,900             | 13,200             | 31,900             | <b>40,100</b>      | 35,800             | 20,700             | 39,250             | 16,075             |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 35                          | 18.9               | 22.7               | 24.0               | 20.3               | 24.5               | 4.98               | 17.5               | 19.3               | 22.6               | 5.80               | 18.1               | 7.05               |
|            | Lithium (Li)         | mg/kg | -                                             | -                           | 22.4               | 33.2               | 34.0               | 27.3               | 33.6               | 8.7                | 29.7               | 32.1               | 36.2               | 10.9               | 26.8               | 9.80               |
|            | Magnesium (Mg)       | mg/kg | -                                             | -                           | 13,400             | 14,300             | 14,000             | 12,100             | 14,800             | 11,200             | 13,300             | 13,700             | 13,500             | 5,380              | 12,568             | 2,732              |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 4,370                       | 1,410              | 1,320              | 1,850              | <b>7,790</b>       | 300                | 150                | 958                | <b>2,820</b>       | <b>1,510</b>       | <b>1,870</b>       | <b>1,998</b>       | 2,178              |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.17                        | 0.0530             | 0.0508             | 0.0637             | 0.0473             | 0.0761             | 0.0059             | 0.0325             | 0.0407             | 0.0399             | 0.0069             | 0.0417             | 0.0223             |
|            | Molybdenum (Mo)      | mg/kg | -                                             | -                           | 2.45               | 1.37               | 1.54               | 5.67               | 1.08               | 0.32               | 0.72               | 1.33               | 1.18               | 0.50               | 1.62               | 1.55               |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 72                          | <b>72.5</b>        | <b>77.2</b>        | <b>74.6</b>        | <b>72.1</b>        | 71.4               | 33.2               | 60.8               | 66.3               | 67.4               | 26.1               | 62.2               | 17.8               |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,580                       | 1,310              | 963                | 1,370              | <b>2,220</b>       | 808                | 494                | 827                | 1,030              | 995                | 625                | 1,064              | 488                |
|            | Potassium (K)        | mg/kg | -                                             | -                           | 4,100              | 5,730              | 5,640              | 4,190              | 5,540              | 1,290              | 3,960              | 4,650              | 5,160              | 1,380              | 4,164              | 1,626              |
|            | Selenium (Se)        | mg/kg | -                                             | -                           | 0.49               | 0.44               | 0.53               | 0.46               | 0.56               | <0.20              | 0.28               | 0.33               | 0.31               | <0.20              | 0.38               | 0.13               |
|            | Silver (Ag)          | mg/kg | -                                             | -                           | 0.12               | 0.14               | 0.15               | 0.10               | 0.23               | <0.10              | <0.10              | 0.11               | 0.13               | <0.10              | 0.13               | 0.040              |
|            | Sodium (Na)          | mg/kg | -                                             | -                           | 203                | 265                | 284                | 212                | 495                | 78                 | 182                | 235                | 223                | 70                 | 225                | 118                |
|            | Strontium (Sr)       | mg/kg | -                                             | -                           | 9.87               | 12.8               | 15.2               | 12.0               | 25.6               | 7.58               | 9.27               | 10.8               | 13.6               | 4.55               | 12.1               | 5.64               |
|            | Sulphur (S)          | mg/kg | -                                             | -                           | <1,000             | <1,000             | <1,000             | <1,000             | 8,100              | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | 1,710              | 2,245              |
|            | Thallium (Tl)        | mg/kg | -                                             | -                           | 0.467              | 0.597              | 0.541              | 0.592              | 0.545              | 0.112              | 0.416              | 0.445              | 0.519              | 0.148              | 0.438              | 0.173              |
|            | Tin (Sn)             | mg/kg | -                                             | -                           | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | 0                  |
|            | Titanium (Ti)        | mg/kg | -                                             | -                           | 833                | 1,040              | 1,020              | 697                | 948                | 379                | 880                | 989                | 979                | 413                | 818                | 244                |
|            | Uranium (U)          | mg/kg | -                                             | -                           | 7.39               | 6.45               | 8.07               | 5.66               | 7.67               | 0.990              | 4.39               | 5.44               | 5.45               | 1.22               | 5.27               | 2.48               |
|            | Vanadium (V)         | mg/kg | -                                             | -                           | 54.3               | 68.4               | 69.2               | 54.7               | 58.4               | 20.1               | 56.6               | 59.7               | 63.4               | 21.9               | 52.7               | 17.5               |
|            | Zinc (Zn)            | mg/kg | 315                                           | 135                         | 59.4               | 67.6               | 64.3               | 52.3               | 70.4               | 17.9               | 50.4               | 55.1               | 54.3               | 19.5               | 51.1               | 18.3               |
|            | Zirconium (Zr)       | mg/kg | -                                             | -                           | 7.8                | 4.6                | 5.2                | 3.7                | 14.4               | 4.2                | 5.1                | 4.4                | 4.9                | 1.7                | 5.6                | 3.4                |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD** Indicates parameter concentration above the AEMP Benchmark.

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life probable effects level (PEL; CCME 2015) except those indicated by α (Ontario Provincial Sediment Quality Guideline [PSQG] severe effect level [SEL]; OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG] probable effects level [PEL; BCMOE 2015]).

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Camp Lake.

**Table D.16: Statistical Comparison of Sediment Physical Properties Between Camp Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results          |                |                                       |         | Summary Statistics |                 |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|-----------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size (n) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                            | none           | YES                                   | 0.006   | Reference          | 5               | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                                   |                |                                       |         | Camp               | 5               | 65.4 | 20.1               | 9.0            | 41.1    | 85.0    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | YES                                   | 0.008   | Reference          | 5               | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                                   |                |                                       |         | Camp               | 5               | 32.1 | 18.2               | 8.2            | 14.2    | 55.1    |
|                             | Clay-Sized Material (%)                | M-W                               | rank           | YES                                   | 0.012   | Reference          | 5               | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                                   |                |                                       |         | Camp               | 5               | 2.6  | 2.0                | 0.9            | 1.0     | 5.5     |
|                             | Moisture (%)                           | tequal                            | none           | YES                                   | 0.006   | Reference          | 5               | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                                   |                |                                       |         | Camp               | 5               | 57.3 | 17.9               | 8.0            | 37.7    | 81.7    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.011   | Reference          | 5               | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                                   |                |                                       |         | Camp               | 5               | 1.4  | 1.2                | 0.5            | 0.3     | 3.4     |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | M-W                               | rank           | NO                                    | 0.298   | Reference          | 5               | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                                   |                |                                       |         | Camp               | 9               | 41.5 | 26.8               | 8.9            | 17.3    | 86.8    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | NO                                    | 0.588   | Reference          | 5               | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                                   |                |                                       |         | Camp               | 9               | 50.6 | 23.6               | 7.9            | 11.8    | 79.2    |
|                             | Clay-Sized Material (%)                | tequal                            | none           | NO                                    | 0.243   | Reference          | 5               | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                                   |                |                                       |         | Camp               | 9               | 7.9  | 4.7                | 1.6            | 1.4     | 14.7    |
|                             | Moisture (%)                           | M-W                               | rank           | YES                                   | 0.001   | Reference          | 5               | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                                   |                |                                       |         | Camp               | 9               | 61.5 | 17.5               | 5.8            | 26.4    | 75.4    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.004   | Reference          | 5               | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                                   |                |                                       |         | Camp               | 9               | 1.5  | 0.9                | 0.3            | 0.3     | 3.1     |

 Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table D.17: Magnitude of Elevation in Sediment Metal Concentrations between Camp Lake and Reference Lake 3 2020 Data, and between Camp Lake 2020 and Baseline Data, Mary River Project CREMP, 2020**

| Parameter       | Camp Lake 2020 versus<br>Reference Lake 3 2020 |                              |                                           |                              | Camp Lake 2020 versus<br>Baseline Period          |                              |                                                   |                              |
|-----------------|------------------------------------------------|------------------------------|-------------------------------------------|------------------------------|---------------------------------------------------|------------------------------|---------------------------------------------------|------------------------------|
|                 | Littoral Stations                              |                              | Profundal Stations                        |                              | Littoral Stations                                 |                              | Profundal Stations                                |                              |
|                 | Reference Lake<br>Concentration<br>(µg/g)      | Magnitude<br>of<br>Elevation | Reference Lake<br>Concentration<br>(µg/g) | Magnitude<br>of<br>Elevation | Camp Lake<br>Baseline<br>Concentration<br>(mg/kg) | Magnitude<br>of<br>Elevation | Camp Lake<br>Baseline<br>Concentration<br>(mg/kg) | Magnitude<br>of<br>Elevation |
| Aluminum (Al)   | 16,880                                         | 0.9                          | 21,800                                    | 0.7                          | 18,267                                            | 0.8                          | 15,175                                            | 1.0                          |
| Antimony (Sb)   | <0.10                                          | 1.1                          | <0.10                                     | 1.0                          | 1.0                                               | 0.1                          | 1.0                                               | 0.1                          |
| Arsenic (As)    | 3.53                                           | 2.6                          | 4.07                                      | 1.4                          | 2.80                                              | 3.2                          | 3.47                                              | 1.6                          |
| Barium (Ba)     | 117                                            | 1.0                          | 122                                       | 0.7                          | 105                                               | 1.2                          | 68                                                | 1.2                          |
| Beryllium (Be)  | 0.65                                           | 1.2                          | 0.80                                      | 1.0                          | 1.0                                               | 0.8                          | 1.0                                               | 0.8                          |
| Bismuth (Bi)    | <0.20                                          | 1.5                          | <0.20                                     | 1.4                          | -                                                 | -                            | -                                                 | -                            |
| Boron (B)       | 12.2                                           | 1.5                          | 14.7                                      | 1.7                          | 0.733                                             | 24.3                         | 1.83                                              | 13.4                         |
| Cadmium (Cd)    | 0.173                                          | 1.6                          | 0.148                                     | 1.1                          | 0.500                                             | 0.5                          | 0.50                                              | 0.3                          |
| Calcium (Ca)    | 5,608                                          | 1.0                          | 5,010                                     | 1.0                          | 3,130                                             | 1.8                          | 2,857                                             | 1.8                          |
| Chromium (Cr)   | 54.3                                           | 1.2                          | 65.0                                      | 1.0                          | 81.0                                              | 0.8                          | 71.0                                              | 0.9                          |
| Cobalt (Co)     | 10.8                                           | 1.7                          | 15.2                                      | 1.1                          | 18.3                                              | 1.0                          | 16.5                                              | 1.0                          |
| Copper (Cu)     | 71.4                                           | 0.7                          | 83.8                                      | 0.5                          | 45.0                                              | 1.1                          | 39.5                                              | 1.0                          |
| Iron (Fe)       | 50,600                                         | 1.2                          | 45,080                                    | 0.8                          | 36,133                                            | 1.7                          | 33,206                                            | 1.1                          |
| Lead (Pb)       | 13.8                                           | 1.4                          | 16.7                                      | 1.1                          | 18.0                                              | 1.1                          | 18.7                                              | 1.0                          |
| Lithium (Li)    | 26.0                                           | 0.9                          | 33.7                                      | 0.8                          | -                                                 | -                            | -                                                 | -                            |
| Magnesium (Mg)  | 11,440                                         | 1.2                          | 14,180                                    | 0.9                          | 13,967                                            | 1.0                          | 10,113                                            | 1.2                          |
| Manganese (Mn)  | 579                                            | 2.4                          | 1,230                                     | 1.7                          | 699                                               | 2.0                          | 942                                               | 2.2                          |
| Mercury (Hg)    | 0.0500                                         | 1.1                          | 0.0583                                    | 0.7                          | 0.100                                             | 0.5                          | 0.100                                             | 0.4                          |
| Molybdenum (Mo) | 4.44                                           | 0.6                          | 2.52                                      | 0.6                          | 1.00                                              | 2.5                          | 1.00                                              | 1.5                          |
| Nickel (Ni)     | 40.0                                           | 1.8                          | 45.0                                      | 1.4                          | 67.0                                              | 1.1                          | 62.5                                              | 1.0                          |
| Phosphorus (P)  | 1,167                                          | 1.1                          | 956                                       | 1.1                          | 800                                               | 1.6                          | 1,125                                             | 0.9                          |
| Potassium (K)   | 4,100                                          | 1.0                          | 5,338                                     | 0.8                          | 3,450                                             | 1.2                          | 3,771                                             | 1.1                          |
| Selenium (Se)   | 0.73                                           | 0.7                          | 0.61                                      | 0.6                          | 1.0                                               | 0.5                          | 1.0                                               | 0.4                          |
| Silver (Ag)     | 0.14                                           | 0.8                          | 0.20                                      | 0.6                          | 0.27                                              | 0.4                          | 0.35                                              | 0.4                          |
| Sodium (Na)     | 304                                            | 0.7                          | 369                                       | 0.6                          | 279                                               | 0.7                          | 254                                               | 0.9                          |
| Strontium (Sr)  | 11.6                                           | 0.9                          | 12.3                                      | 1.0                          | 9.33                                              | 1.1                          | 12.0                                              | 1.0                          |
| Sulphur (S)     | 1,400                                          | 0.7                          | 1,140                                     | 1.6                          | -                                                 | -                            | -                                                 | -                            |
| Thallium (Tl)   | 0.379                                          | 1.2                          | 0.594                                     | 0.7                          | 1.0                                               | 0.5                          | 1.0                                               | 0.4                          |
| Tin (Sn)        | <2.0                                           | 1.0                          | <2.0                                      | 1.0                          | -                                                 | -                            | -                                                 | -                            |
| Titanium (Ti)   | 1,006                                          | 0.8                          | 1,136                                     | 0.7                          | -                                                 | -                            | -                                                 | -                            |
| Uranium (U)     | 11.0                                           | 0.7                          | 19.7                                      | 0.3                          | -                                                 | -                            | -                                                 | -                            |
| Vanadium (V)    | 54.1                                           | 1.0                          | 63.4                                      | 0.8                          | 69.0                                              | 0.8                          | 56.8                                              | 0.9                          |
| Zinc (Zn)       | 73.1                                           | 0.8                          | 83.8                                      | 0.6                          | 67.0                                              | 0.9                          | 56.8                                              | 0.9                          |
| Zirconium (Zr)  | 4.5                                            | 1.7                          | 3.9                                       | 1.4                          | -                                                 | -                            | -                                                 | -                            |

 Denotes slight elevation (concentration 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).  
 Denotes moderate elevation (concentration 5 to 10 times higher than mean reference area value or baseline period value, as applicable).  
 Denotes high elevation (concentration is ≥ 10 times higher than mean reference area value or baseline period value, as applicable).

Note: ' - ' indicates baseline data not available.

**Table D.18: Deposited Sediment Field Sampling Observations at Sheardown Lake Tributaries 1, 12, and 9<sup>a</sup>, Mary River Project CREMP, August 2020**

| Study Area                           | Station  | Texture of Collected Sediment | Silt Presence <sup>b</sup>       |
|--------------------------------------|----------|-------------------------------|----------------------------------|
| Sheardown Lake Tributary 1 (SDLT1)   | SDLT1-1  | red-brown silt                | precipitate and deposits (>1 mm) |
|                                      | SDLT1-3  | red-brown silt                | precipitate and deposits (>1 mm) |
|                                      | SDLT1-5  | red-brown silt                | precipitate and deposits (>1 mm) |
| Sheardown Lake Tributary 12 (SDLT12) | SDLT12-1 | coarse sand                   | precipitate and deposits (<1 mm) |
|                                      | SDLT12-2 | coarse sand and gravel        | precipitate and deposits (<1 mm) |
|                                      | SDLT12-3 | coarse sand and gravel        | precipitate and deposits (<1 mm) |
| Sheardown Lake Tributary 9 (SDLT9)   | SDLT9-1  | medium (sized) coarse sand    | none observed                    |
|                                      | SDLT9-3  | medium (sized) coarse sand    | precipitate and deposits (<1 mm) |
|                                      | SDLT9-5  | medium (sized) coarse sand    | none observed                    |

<sup>a</sup> Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.

<sup>b</sup> Evidence of silt precipitate included fine material present on the surface of in-stream substrate and/or as interstitial deposits not otherwise expected to occur at such habitat.

**Table D.19: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 1 (SDLT1) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Sheardown Lake Tributary 1 Station |         |         | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|------------------------------------|---------|---------|-------------------------------|--------------------|----------------|
|                      |       |                      | SDLT1-1                            | SDLT1-3 | SDLT1-5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>a</sup>      | 0.71                               | 0.97    | 0.61    | 0.76                          | 0.19               | 0.107          |
| Aluminum (Al)        | µg/g  | -                    | 17,600                             | 15,900  | 14,400  | 15,967                        | 1,601              | 924            |
| Antimony (Sb)        | µg/g  | -                    | 0.12                               | 0.23    | 0.15    | 0.17                          | 0.057              | 0.033          |
| Arsenic (As)         | µg/g  | 17                   | 2.26                               | 4.50    | 3.11    | 3.29                          | 1.13               | 0.65           |
| Barium (Ba)          | µg/g  | -                    | 78.0                               | 51.9    | 61.0    | 63.6                          | 13.2               | 7.65           |
| Beryllium (Be)       | µg/g  | -                    | 0.68                               | 0.66    | 0.60    | 0.65                          | 0.042              | 0.024          |
| Bismuth (Bi)         | µg/g  | -                    | 0.61                               | 0.31    | 0.53    | 0.48                          | 0.16               | 0.090          |
| Boron (B)            | µg/g  | -                    | 7.3                                | 7.6     | 5.6     | 6.8                           | 1.1                | 0.62           |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.156                              | 0.113   | 0.160   | 0.143                         | 0.0261             | 0.0150         |
| Calcium (Ca)         | µg/g  | -                    | 4,850                              | 2,730   | 3,790   | 3,790                         | 1,060              | 612            |
| Chromium (Cr)        | µg/g  | 90                   | 34.5                               | 35.5    | 31.2    | 33.7                          | 2.25               | 1.30           |
| Cobalt (Co)          | µg/g  | -                    | 12.4                               | 14.9    | 12.7    | 13.3                          | 1.37               | 0.788          |
| Copper (Cu)          | µg/g  | 197                  | 25.5                               | 21.5    | 24.9    | 24.0                          | 2.16               | 1.25           |
| Iron (Fe)            | µg/g  | 40,000 <sup>a</sup>  | 114,000                            | 174,000 | 170,000 | 152,667                       | 33,546             | 19,368         |
| Lead (Pb)            | µg/g  | 91.3                 | 13.0                               | 12.6    | 11.7    | 12.4                          | 0.666              | 0.384          |
| Lithium (Li)         | µg/g  | -                    | 19.0                               | 17.8    | 16.6    | 17.8                          | 1.20               | 0.693          |
| Magnesium (Mg)       | µg/g  | -                    | 16,500                             | 12,800  | 12,700  | 14,000                        | 2,166              | 1,250          |
| Manganese (Mn)       | µg/g  | 1,100 <sup>a,β</sup> | 646                                | 657     | 740     | 681                           | 51.4               | 29.7           |
| Mercury (Hg)         | µg/g  | 0.486                | 0.0059                             | 0.0072  | 0.0063  | 0.0065                        | 0.00067            | 0.00038        |
| Molybdenum (Mo)      | µg/g  | -                    | 5.41                               | 7.19    | 4.59    | 5.73                          | 1.33               | 0.767          |
| Nickel (Ni)          | µg/g  | 75 <sup>a,β</sup>    | 32.8                               | 34.4    | 32.2    | 33.1                          | 1.14               | 0.657          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>a</sup>   | 368                                | 287     | 378     | 344                           | 49.9               | 28.8           |
| Potassium (K)        | µg/g  | -                    | 6,590                              | 5,870   | 4,990   | 5,817                         | 801                | 463            |
| Selenium (Se)        | µg/g  | -                    | <0.20                              | 0.22    | 0.22    | 0.21                          | 0.012              | 0.0067         |
| Silver (Ag)          | µg/g  | -                    | 0.14                               | 0.10    | 0.13    | 0.12                          | 0.021              | 0.012          |
| Sodium (Na)          | µg/g  | -                    | 158                                | 118     | 101     | 126                           | 29                 | 17             |
| Strontium (Sr)       | µg/g  | -                    | 4.43                               | 3.52    | 3.67    | 3.87                          | 0.488              | 0.282          |
| Sulphur (S)          | µg/g  | -                    | <1,000                             | <1,000  | <1,000  | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.296                              | 0.276   | 0.241   | 0.271                         | 0.0278             | 0.0161         |
| Tin (Sn)             | µg/g  | -                    | <2.0                               | <2.0    | <2.0    | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 971                                | 714     | 777     | 821                           | 134                | 77             |
| Uranium (U)          | µg/g  | -                    | 3.85                               | 5.94    | 3.26    | 4.35                          | 1.41               | 0.813          |
| Vanadium (V)         | µg/g  | -                    | 31.9                               | 25.4    | 25.8    | 27.7                          | 3.64               | 2.10           |
| Zinc (Zn)            | µg/g  | 315                  | 79.4                               | 65.7    | 82.4    | 75.8                          | 8.90               | 5.14           |
| Zirconium (Zr)       | µg/g  | -                    | 9.5                                | 10.6    | 6.9     | 9.0                           | 1.9                | 1.1            |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.20: Magnitude of Elevation in Deposited Sediment Metal Concentrations at the Sheardown Lake Tributaries Compared to Average Lotic Reference Area Data, Mary River Project CREMP, August 2020**

| Parameter            | Units | Reference Area Data       |                              | Sheardown Lake Tributary 1 (SDLT1)<br>Magnitude of Elevation | Sheardown Lake Tributary 12 (SDLT12)<br>Magnitude of Elevation | Sheardown Lake Tributary 9 (SDLT9)<br>Magnitude of Elevation |
|----------------------|-------|---------------------------|------------------------------|--------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------|
|                      |       | Reference Creek (REF-CRK) | Mary River Reference (GO-09) |                                                              |                                                                |                                                              |
| Total Organic Carbon | %     | 0.12                      | 0.11                         | 6.5                                                          | 6.4                                                            | 17.4                                                         |
| Aluminum (Al)        | µg/g  | 584                       | 2,757                        | 16.6                                                         | 8.5                                                            | 7.3                                                          |
| Antimony (Sb)        | µg/g  | <0.10                     | <0.10                        | 1.7                                                          | 2.2                                                            | 1.1                                                          |
| Arsenic (As)         | µg/g  | 0.22                      | 0.38                         | 11.9                                                         | 21.1                                                           | 6.0                                                          |
| Barium (Ba)          | µg/g  | 2.72                      | 12.6                         | 14.2                                                         | 3.8                                                            | 7.2                                                          |
| Beryllium (Be)       | µg/g  | <0.10                     | 0.14                         | 5.6                                                          | 5.9                                                            | 2.8                                                          |
| Bismuth (Bi)         | µg/g  | <0.20                     | <0.20                        | 2.4                                                          | 1.3                                                            | 1.1                                                          |
| Boron (B)            | µg/g  | <5.0                      | 5.4                          | 1.3                                                          | 1.1                                                            | 1.6                                                          |
| Cadmium (Cd)         | µg/g  | <0.020                    | <0.020                       | 7.2                                                          | 2.5                                                            | 3.2                                                          |
| Calcium (Ca)         | µg/g  | 494                       | 2,750                        | 4.5                                                          | 1.5                                                            | 3.5                                                          |
| Chromium (Cr)        | µg/g  | 7.79                      | 13.6                         | 3.4                                                          | 3.1                                                            | 2.3                                                          |
| Cobalt (Co)          | µg/g  | 0.953                     | 2.40                         | 9.8                                                          | 10.7                                                           | 4.6                                                          |
| Copper (Cu)          | µg/g  | 1.21                      | 4.45                         | 12.6                                                         | 10.2                                                           | 8.2                                                          |
| Iron (Fe)            | µg/g  | 12,493                    | 11,063                       | 13.0                                                         | 29.4                                                           | 5.1                                                          |
| Lead (Pb)            | µg/g  | 1.49                      | 3.07                         | 6.2                                                          | 2.7                                                            | 2.7                                                          |
| Lithium (Li)         | µg/g  | <2.0                      | 5.0                          | 6.2                                                          | 2.9                                                            | 2.7                                                          |
| Magnesium (Mg)       | µg/g  | 444                       | 2,810                        | 18.3                                                         | 7.6                                                            | 7.9                                                          |
| Manganese (Mn)       | µg/g  | 27.4                      | 75.7                         | 16.9                                                         | 20.1                                                           | 7.3                                                          |
| Mercury (Hg)         | µg/g  | <0.0050                   | <0.0050                      | 1.3                                                          | 1.0                                                            | 2.4                                                          |
| Molybdenum (Mo)      | µg/g  | <0.10                     | 0.11                         | 53.9                                                         | 36.0                                                           | 17.1                                                         |
| Nickel (Ni)          | µg/g  | 1.76                      | 6.11                         | 12.1                                                         | 13.4                                                           | 9.0                                                          |
| Phosphorus (P)       | µg/g  | 167                       | 350                          | 1.5                                                          | 1.1                                                            | 1.9                                                          |
| Potassium (K)        | µg/g  | 133                       | 750                          | 25.7                                                         | 3.5                                                            | 7.1                                                          |
| Selenium (Se)        | µg/g  | <0.20                     | <0.20                        | 1.1                                                          | 1.3                                                            | 1.4                                                          |
| Silver (Ag)          | µg/g  | <0.10                     | <0.10                        | 1.2                                                          | 1.0                                                            | 1.0                                                          |
| Sodium (Na)          | µg/g  | <50                       | 68                           | 2.2                                                          | 0.9                                                            | 1.1                                                          |
| Strontium (Sr)       | µg/g  | 2.00                      | 4.72                         | 1.4                                                          | 0.7                                                            | 1.4                                                          |
| Sulphur (S)          | µg/g  | <1,000                    | <1,000                       | 1.0                                                          | 1.0                                                            | 1.0                                                          |
| Thallium (Tl)        | µg/g  | <0.050                    | 0.068                        | 4.7                                                          | 1.2                                                            | 2.7                                                          |
| Tin (Sn)             | µg/g  | <2.0                      | <2.0                         | 1.0                                                          | 1.0                                                            | 1.0                                                          |
| Titanium (Ti)        | µg/g  | 83.3                      | 353                          | 6.1                                                          | 1.6                                                            | 3.6                                                          |
| Uranium (U)          | µg/g  | 0.479                     | 0.922                        | 6.9                                                          | 3.7                                                            | 2.0                                                          |
| Vanadium (V)         | µg/g  | 16.8                      | 19.5                         | 1.5                                                          | 0.9                                                            | 1.0                                                          |
| Zinc (Zn)            | µg/g  | 3.03                      | 10.3                         | 16.2                                                         | 5.4                                                            | 4.9                                                          |
| Zirconium (Zr)       | µg/g  | 2.1                       | 5.8                          | 2.9                                                          | 1.1                                                            | 0.9                                                          |



Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference creek value).  
Denotes moderate elevation (mean concentration 5 to 10 times higher than respective mean reference creek value).  
Denotes highly elevated (mean concentration ≥10 times higher than respective mean reference creek value).

**Table D.21: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 12 (SDLT12) Stations, Mary River Project CREMP, August 2020**

| Parameter            | Units | SQG <sup>a</sup>     | Sheardown Lake Tributary 12 Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|-------------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | SDLT12-1                            | SDLT12-2 | SDLT12-3 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.91                                | 0.54     | 0.80     | 0.75                          | 0.19               | 0.11           |
| Aluminum (Al)        | µg/g  | -                    | 9,070                               | 7,840    | 7,550    | 8,153                         | 807                | 466            |
| Antimony (Sb)        | µg/g  | -                    | 0.21                                | 0.21     | 0.25     | 0.22                          | 0.02               | 0.01           |
| Arsenic (As)         | µg/g  | 17                   | 5.04                                | 6.95     | 5.50     | 5.83                          | 1.00               | 0.576          |
| Barium (Ba)          | µg/g  | -                    | 23.0                                | 10.8     | 17.5     | 17.1                          | 6.11               | 3.53           |
| Beryllium (Be)       | µg/g  | -                    | 0.68                                | 0.70     | 0.66     | 0.68                          | 0.020              | 0.012          |
| Bismuth (Bi)         | µg/g  | -                    | 0.29                                | 0.21     | 0.26     | 0.25                          | 0.040              | 0.023          |
| Boron (B)            | µg/g  | -                    | 6.3                                 | <5.0     | 5.3      | 5.5                           | 0.68               | 0.39           |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.050                               | 0.040    | 0.062    | 0.051                         | 0.011              | 0.0064         |
| Calcium (Ca)         | µg/g  | -                    | 1,830                               | 549      | 1,290    | 1,223                         | 643                | 371            |
| Chromium (Cr)        | µg/g  | 90                   | 30.1                                | 31.3     | 30.3     | 30.6                          | 0.643              | 0.371          |
| Cobalt (Co)          | µg/g  | -                    | 14.6                                | 15.3     | 13.8     | 14.6                          | 0.751              | 0.433          |
| Copper (Cu)          | µg/g  | 197                  | 20.1                                | 18.8     | 19.3     | 19.4                          | 0.656              | 0.379          |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 283,000                             | 378,000  | 374,000  | 345,000                       | 53,731             | 31,021         |
| Lead (Pb)            | µg/g  | 91.3                 | 6.24                                | 4.28     | 5.91     | 5.48                          | 1.05               | 0.606          |
| Lithium (Li)         | µg/g  | -                    | 10.1                                | 7.0      | 7.4      | 8.2                           | 1.7                | 0.97           |
| Magnesium (Mg)       | µg/g  | -                    | 6,890                               | 5,150    | 5,330    | 5,790                         | 957                | 552            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 699                                 | 905      | 825      | 810                           | 104                | 60             |
| Mercury (Hg)         | µg/g  | 0.486                | 0.0055                              | <0.0050  | <0.0050  | 0.0052                        | 0.00029            | 0.00017        |
| Molybdenum (Mo)      | µg/g  | -                    | 4.10                                | 3.63     | 3.73     | 3.82                          | 0.248              | 0.143          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 36.3                                | 38.2     | 34.8     | 36.4                          | 1.70               | 0.984          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 300                                 | 198      | 259      | 252                           | 51.3               | 29.6           |
| Potassium (K)        | µg/g  | -                    | 1,180                               | 410      | 810      | 800                           | 385                | 222            |
| Selenium (Se)        | µg/g  | -                    | <0.20                               | 0.28     | 0.32     | 0.27                          | 0.061              | 0.035          |
| Silver (Ag)          | µg/g  | -                    | <0.10                               | <0.10    | <0.10    | 0.10                          | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                                 | <50      | <50      | <50                           | 0                  | 0              |
| Strontium (Sr)       | µg/g  | -                    | 2.62                                | 1.50     | 2.13     | 2.08                          | 0.561              | 0.324          |
| Sulphur (S)          | µg/g  | -                    | <1,000                              | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.084                               | <0.050   | 0.071    | 0.068                         | 0.017              | 0.010          |
| Tin (Sn)             | µg/g  | -                    | <2.0                                | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 283                                 | 146      | 226      | 218                           | 69                 | 40             |
| Uranium (U)          | µg/g  | -                    | 2.63                                | 1.88     | 2.47     | 2.33                          | 0.395              | 0.228          |
| Vanadium (V)         | µg/g  | -                    | 16.3                                | 14.3     | 16.3     | 15.6                          | 1.15               | 0.667          |
| Zinc (Zn)            | µg/g  | 315                  | 31.1                                | 19.8     | 24.7     | 25.2                          | 5.67               | 3.27           |
| Zirconium (Zr)       | µg/g  | -                    | 3.7                                 | 3.1      | 3.8      | 3.5                           | 0.38               | 0.22           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.22: Deposited Sediment Total Organic Carbon and Metal Concentrations at Sheardown Lake Tributary 9 (SDLT9) Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Sheardown Lake Tributary 9 Station |         |         | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|------------------------------------|---------|---------|-------------------------------|--------------------|----------------|
|                      |       |                      | SDLT9-1                            | SDLT9-3 | SDLT9-5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.81                               | 1.31    | 3.96    | 2.03                          | 1.69               | 0.977          |
| Aluminum (Al)        | µg/g  | -                    | 4,310                              | 5,880   | 10,800  | 6,997                         | 3,386              | 1,955          |
| Antimony (Sb)        | µg/g  | -                    | <0.10                              | <0.10   | 0.12    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.86                               | 1.13    | 2.97    | 1.65                          | 1.15               | 0.66           |
| Barium (Ba)          | µg/g  | -                    | 17.6                               | 24.8    | 54.3    | 32.2                          | 19.4               | 11.2           |
| Beryllium (Be)       | µg/g  | -                    | 0.17                               | 0.24    | 0.55    | 0.32                          | 0.20               | 0.12           |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                              | <0.20   | 0.26    | 0.22                          | 0.035              | 0.020          |
| Boron (B)            | µg/g  | -                    | <5.0                               | <5.0    | 15.5    | 8.50                          | 6.06               | 3.50           |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.037                              | 0.044   | 0.110   | 0.064                         | 0.040              | 0.023          |
| Calcium (Ca)         | µg/g  | -                    | 1,610                              | 1,960   | 5,190   | 2,920                         | 1,974              | 1,139          |
| Chromium (Cr)        | µg/g  | 90                   | 15.1                               | 18.6    | 34.5    | 22.7                          | 10.3               | 5.97           |
| Cobalt (Co)          | µg/g  | -                    | 3.86                               | 5.16    | 9.71    | 6.24                          | 3.07               | 1.77           |
| Copper (Cu)          | µg/g  | 197                  | 7.17                               | 11.3    | 28.5    | 15.7                          | 11.3               | 6.53           |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 31,300                             | 42,100  | 107,000 | 60,133                        | 40,945             | 23,640         |
| Lead (Pb)            | µg/g  | 91.3                 | 3.25                               | 4.27    | 8.92    | 5.48                          | 3.02               | 1.75           |
| Lithium (Li)         | µg/g  | -                    | 4.90                               | 6.50    | 11.6    | 7.67                          | 3.50               | 2.02           |
| Magnesium (Mg)       | µg/g  | -                    | 3,630                              | 4,990   | 9,430   | 6,017                         | 3,033              | 1,751          |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 164                                | 225     | 493     | 294                           | 175                | 101            |
| Mercury (Hg)         | µg/g  | 0.486                | 0.0061                             | 0.0103  | 0.0196  | 0.0120                        | 0.0069             | 0.0040         |
| Molybdenum (Mo)      | µg/g  | -                    | 0.960                              | 1.22    | 3.27    | 1.82                          | 1.27               | 0.731          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 13.6                               | 18.6    | 41.3    | 24.5                          | 14.8               | 8.52           |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 330                                | 347     | 606     | 428                           | 155                | 89             |
| Potassium (K)        | µg/g  | -                    | 900                                | 1,380   | 2,510   | 1,597                         | 827                | 477            |
| Selenium (Se)        | µg/g  | -                    | <0.20                              | <0.20   | 0.41    | 0.27                          | 0.12               | 0.070          |
| Silver (Ag)          | µg/g  | -                    | <0.10                              | <0.10   | <0.10   | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                                | <50     | 88      | 63                            | 22                 | 13             |
| Strontium (Sr)       | µg/g  | -                    | 3.13                               | 2.99    | 6.05    | 4.06                          | 1.73               | 1.00           |
| Sulphur (S)          | µg/g  | -                    | <1,000                             | <1,000  | <1,000  | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.088                              | 0.130   | 0.240   | 0.153                         | 0.078              | 0.045          |
| Tin (Sn)             | µg/g  | -                    | <2.0                               | <2.0    | <2.0    | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 379                                | 433     | 642     | 485                           | 139                | 80             |
| Uranium (U)          | µg/g  | -                    | 0.672                              | 0.800   | 2.37    | 1.28                          | 0.946              | 0.546          |
| Vanadium (V)         | µg/g  | -                    | 11.6                               | 15.3    | 27.1    | 18.0                          | 8.10               | 4.67           |
| Zinc (Zn)            | µg/g  | 315                  | 13.5                               | 18.7    | 37.2    | 23.1                          | 12.5               | 7.19           |
| Zirconium (Zr)       | µg/g  | -                    | 1.4                                | 1.9     | 5.3     | 2.9                           | 2.1                | 1.2            |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except  $\alpha$  = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and  $\beta$  = British Columbia Working SQG PEL (BC ENV 2020).



**Table D.23: Field Observations of Sediment Properties at Sheardown Lake Northwest (DLO-01) Benthic Stations<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station   | Station Depth (m) | Colour and Texture Observations                        | Evidence of Anoxia <sup>b</sup> | Plant or Algal Presence          |
|-----------|-------------------|--------------------------------------------------------|---------------------------------|----------------------------------|
| DLO-01-9  | 7.6               | thin oxidized layer over brown-coloured silt and sand  | none detected                   | sparse macrophytes, sparse algae |
| DLO-01-4  | 7.5               | brown-coloured silt                                    | none detected                   | sparse macrophytes, sparse algae |
| DLO-01-3  | 8.2               | brown-coloured silt                                    | none detected                   | sparse macrophytes               |
| DLO-01-11 | 8.2               | thin layer of red-brown silt floc over grey-brown silt | slight hydrogen sulphide odour  | none observed                    |
| DLO-01-10 | 7.9               | reddish-brown coloured silt over grey-brown sandy silt | none detected                   | none observed                    |
| DLO-01-5  | 23.3              | brown-coloured silt                                    | slight hydrogen sulphide odour  | none observed                    |
| DLO-01-14 | 22.0              | reddish-brown coloured silt over grey-brown sandy silt | slight hydrogen sulphide odour  | none observed                    |
| DLO-01-15 | 21.7              | brown-coloured silt                                    | none detected                   | none observed                    |
| DLO-01-2  | 17.5              | brown-coloured silt                                    | none detected                   | none observed                    |
| DLO-01-12 | 14.0              | reddish-brown coloured silt                            | none detected                   | none observed                    |

<sup>a</sup> Sediment particle size and benthic invertebrate community samples were collected using a petite-Ponar.

<sup>b</sup> Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

**Table D.24: Observations from Sediment Cores Collected at Sheardown Lake NW (DLO-01), Mary River Project CREMP, August 2020**

| Sample Station | Station Depth (m) | Station Type | Core Number | Core Length (cm) | Surficial Substrate Texture Description                                                                                            |
|----------------|-------------------|--------------|-------------|------------------|------------------------------------------------------------------------------------------------------------------------------------|
| DLO-01-05      | 23.1              | Profundal    | 1           | 14.0             | dark brown silt floc over consolidated dark grey silt/clay                                                                         |
|                |                   |              | 2           | 12.0             |                                                                                                                                    |
|                |                   |              | 3           | 13.0             |                                                                                                                                    |
|                |                   |              | 4           | 12.5             |                                                                                                                                    |
| DD-HAB 9-STN2  | 10.8              | Littoral     | 1           | 22.0             | unconsolidated red brown silt overlying grey silt (some sand intermixed) and dark grey silty-clay                                  |
|                |                   |              | 2           | 17.5             |                                                                                                                                    |
|                |                   |              | 3           | 19.0             |                                                                                                                                    |
|                |                   |              | 4           | 18.0             |                                                                                                                                    |
| DLO-01-08      | 11.5              | Littoral     | 1           | 19.0             | red-brown silt floc overlying brown silt and grey silty-clay layers containing some fine sand                                      |
|                |                   |              | 2           | 19.0             |                                                                                                                                    |
|                |                   |              | 3           | 19.5             |                                                                                                                                    |
|                |                   |              | 4           | 18.0             |                                                                                                                                    |
| DLO-01         | 20.8              | Profundal    | 1           | 5.5              | brown silt floc overlying consolidated brown silt containing some fine sand                                                        |
|                |                   |              | 2           | 11.5             |                                                                                                                                    |
|                |                   |              | 3           | 12.0             |                                                                                                                                    |
|                |                   |              | 4           | 5.0              |                                                                                                                                    |
| DLO-01-13      | 18.4              | Profundal    | 1           | 19.0             | red-brown silt floc overlying consolidated brown silt containing some fine sand                                                    |
|                |                   |              | 2           | 21.0             |                                                                                                                                    |
|                |                   |              | 3           | 19.0             |                                                                                                                                    |
|                |                   |              | 4           | 16.0             |                                                                                                                                    |
| DLO-01-2       | 18.6              | Profundal    | 1           | 16.0             | red-brown silt floc overlying brown silt-clay and grey silt-clay layers containing some fine sand; black streaking in upper layers |
|                |                   |              | 2           | 8.0              |                                                                                                                                    |
|                |                   |              | 3           | 19.5             |                                                                                                                                    |
|                |                   |              | 4           | 18.5             |                                                                                                                                    |
| DLO-01-9       | 7.8               | Littoral     | 1           | 16.0             | red-brown silt floc overlying grey silt; some black streaking in third core                                                        |
|                |                   |              | 2           | 20.0             |                                                                                                                                    |
|                |                   |              | 3           | 21.0             |                                                                                                                                    |
|                |                   |              | 4           | 20.0             |                                                                                                                                    |
| DLO-01-10      | 7.6               | Littoral     | 1           | 14.0             | red-brown silt floc overlying grey silty clay and brown silty clay layers, each containing some sand                               |
|                |                   |              | 2           | 10.0             |                                                                                                                                    |
|                |                   |              | 3           | 14.0             |                                                                                                                                    |
|                |                   |              | 4           | 15.0             |                                                                                                                                    |

**Table D.25: Sediment Particle Size, Total Organic Carbon, Metal Concentrations at Sheardown Lake Northwest (DLO-01) Sediment Stations, Mary River Project CREMP, August 2020**

| Parameter  |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Sheardown Lake Northwest Stations |                          |                     |                    |                       |                      |                     |                      | Summary Statistics |                    |
|------------|----------------------|-------|-----------------------------------------------|-----------------------------|-----------------------------------|--------------------------|---------------------|--------------------|-----------------------|----------------------|---------------------|----------------------|--------------------|--------------------|
|            |                      |       |                                               |                             | DLO-01-5 (profundal)              | DD-HAB 9-STN2 (littoral) | DLO-01-8 (littoral) | DLO-01 (profundal) | DLO-01-13 (profundal) | DLO-01-2 (profundal) | DLO-01-9 (littoral) | DLO-01-10 (littoral) | Mean               | Standard Deviation |
| Non-metals | Sand                 | %     | -                                             | -                           | 8.5                               | 38.0                     | 20.1                | 35.3               | 18.9                  | 9.9                  | 45.0                | 93.0                 | 33.6               | 27.4               |
|            | Silt                 | %     | -                                             | -                           | 74.3                              | 47.2                     | 65.8                | 49.3               | 64.7                  | 78.9                 | 44.6                | 6.40                 | 53.9               | 23.0               |
|            | Clay                 | %     | -                                             | -                           | 17.2                              | 14.8                     | 14.1                | 15.3               | 16.3                  | 11.1                 | 10.4                | <1.0                 | 12.5               | 5.22               |
|            | Moisture             | %     | -                                             | -                           | 64.3                              | 75.2                     | 76.2                | 49.9               | 65.7                  | 70.9                 | 84.3                | 27.4                 | 64.2               | 18.0               |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | -                           | 1.76                              | 3.15                     | 1.60                | 0.38               | 1.24                  | 1.30                 | 3.47                | 0.17                 | 1.63               | 1.18               |
|            |                      |       |                                               |                             |                                   |                          |                     |                    |                       |                      |                     |                      |                    |                    |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | -                           | 23,100                            | 19,300                   | 20,800              | 15,000             | 23,700                | 20,900               | 19,800              | 2,640                | 18,155             | 6,808              |
|            | Antimony (Sb)        | mg/kg | -                                             | -                           | <0.10                             | <0.10                    | <0.10               | <0.10              | <0.10                 | <0.10                | <0.10               | <0.10                | <0.10              | 0                  |
|            | Arsenic (As)         | mg/kg | 17                                            | 6.2                         | 4.40                              | <b>7.13</b>              | 5.43                | 2.87               | 4.03                  | 3.57                 | 3.03                | 0.62                 | 3.89               | 1.92               |
|            | Barium (Ba)          | mg/kg | -                                             | -                           | 144                               | 149                      | 80.9                | 61.5               | 90.4                  | 143                  | 106                 | 11.1                 | 98.2               | 47.9               |
|            | Beryllium (Be)       | mg/kg | -                                             | -                           | 1.05                              | 1.09                     | 1.17                | 0.72               | 1.12                  | 1.01                 | 1.08                | 0.16                 | 0.925              | 0.338              |
|            | Bismuth (Bi)         | mg/kg | -                                             | -                           | 0.29                              | 0.25                     | 0.23                | <0.20              | 0.23                  | 0.22                 | 0.25                | <0.20                | 0.23               | 0.030              |
|            | Boron (B)            | mg/kg | -                                             | -                           | 33.8                              | 30.7                     | 36.6                | 21.6               | 33.9                  | 30.3                 | 30.7                | <5.0                 | 27.8               | 10.2               |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 1.5                         | 0.270                             | 0.447                    | 0.225               | 0.186              | 0.263                 | 0.292                | 0.309               | 0.025                | 0.252              | 0.119              |
|            | Calcium (Ca)         | mg/kg | -                                             | -                           | 4,540                             | 5,200                    | 4,290               | 3,390              | 4,470                 | 4,680                | 5,280               | 1,320                | 4,146              | 1,283              |
|            | Chromium (Cr)        | mg/kg | 90                                            | 97                          | 77.3                              | 74.2                     | 77.1                | 54.5               | 79.4                  | 73.9                 | 75.4                | 13.8                 | 65.7               | 22.4               |
|            | Cobalt (Co)          | mg/kg | -                                             | -                           | 19.0                              | 16.2                     | 15.0                | 11.2               | 17.0                  | 16.2                 | 12.7                | 2.18                 | 13.7               | 5.25               |
|            | Copper (Cu)          | mg/kg | 197                                           | 58                          | 47.9                              | 53.0                     | 43.4                | 33.8               | 47.2                  | 41.1                 | 49.7                | 5.82                 | 40.2               | 15.1               |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 52,200                      | <b>60,300</b>                     | <b>62,200</b>            | <b>48,300</b>       | 28,800             | <b>42,200</b>         | <b>42,100</b>        | <b>42,900</b>       | 11,400               | <b>42,275</b>      | 16,447             |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 35                          | 22.8                              | 21.5                     | 20.2                | 14.2               | 22.3                  | 19.6                 | 20.6                | 3.70                 | 18.1               | 6.40               |
|            | Lithium (Li)         | mg/kg | -                                             | -                           | 36.7                              | 36.4                     | 39.1                | 23.9               | 38.8                  | 33.5                 | 37.6                | 5.1                  | 31.4               | 11.7               |
|            | Magnesium (Mg)       | mg/kg | -                                             | -                           | 14,800                            | 12,700                   | 12,300              | 9,520              | 14,900                | 13,200               | 12,700              | 2,020                | 11,518             | 4,186              |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 4,530                       | <b>5,580</b>                      | 974                      | 649                 | 843                | <b>1,140</b>          | <b>13,600</b>        | 404                 | 77.0                 | <b>2,908</b>       | 4,659              |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.17                        | 0.0521                            | 0.0517                   | 0.0269              | 0.0187             | 0.0329                | 0.0290               | 0.0388              | <0.0050              | 0.0319             | 0.0159             |
|            | Molybdenum (Mo)      | mg/kg | -                                             | -                           | 6.69                              | 5.20                     | 3.43                | 1.18               | 1.80                  | 11.2                 | 3.15                | 0.52                 | 4.15               | 3.51               |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 77                          | 68.8                              | <b>80.4</b>              | 67.4                | 46.9               | 65.4                  | 64.3                 | 66.1                | 10.4                 | 58.7               | 21.6               |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,958                       | 1,040                             | 1,130                    | 1,140               | 860                | 870                   | 831                  | 707                 | 351                  | 866                | 258                |
|            | Potassium (K)        | mg/kg | -                                             | -                           | 5,970                             | 5,240                    | 5,600               | 3,800              | 6,050                 | 5,330                | 5,150               | 680                  | 4,728              | 1,777              |
|            | Selenium (Se)        | mg/kg | -                                             | -                           | 0.47                              | 0.57                     | 0.32                | <0.20              | 0.30                  | 0.30                 | 0.38                | <0.20                | 0.34               | 0.13               |
|            | Silver (Ag)          | mg/kg | -                                             | -                           | 0.18                              | 0.20                     | 0.15                | 0.13               | 0.18                  | 0.15                 | 0.17                | <0.10                | 0.16               | 0.032              |
|            | Sodium (Na)          | mg/kg | -                                             | -                           | 320                               | 308                      | 277                 | 212                | 317                   | 282                  | 294                 | <50                  | 258                | 91                 |
|            | Strontium (Sr)       | mg/kg | -                                             | -                           | 12.2                              | 11.4                     | 11.5                | 9.20               | 12.5                  | 11.7                 | 11.0                | 3.88                 | 10.4               | 2.82               |
|            | Sulphur (S)          | mg/kg | -                                             | -                           | <1,000                            | <1,000                   | <1,000              | <1,000             | <1,000                | <1,000               | <1,000              | <1,000               | <1,000             | 0                  |
|            | Thallium (Tl)        | mg/kg | -                                             | -                           | 0.598                             | 0.606                    | 0.487               | 0.332              | 0.558                 | 0.568                | 0.518               | 0.064                | 0.466              | 0.185              |
|            | Tin (Sn)             | mg/kg | -                                             | -                           | <2.0                              | <2.0                     | <2.0                | <2.0               | <2.0                  | <2.0                 | <2.0                | <2.0                 | <2.0               | 0                  |
|            | Titanium (Ti)        | mg/kg | -                                             | -                           | 1,310                             | 1,150                    | 1,200               | 884                | 1,340                 | 1,240                | 1,160               | 227                  | 1,064              | 366                |
|            | Uranium (U)          | mg/kg | -                                             | -                           | 7.61                              | 9.91                     | 5.74                | 4.92               | 7.08                  | 5.86                 | 7.75                | 1.27                 | 6.27               | 2.54               |
|            | Vanadium (V)         | mg/kg | -                                             | -                           | 62.0                              | 57.1                     | 57.6                | 42.3               | 64.5                  | 58.0                 | 57.7                | 10.7                 | 51.2               | 17.6               |
|            | Zinc (Zn)            | mg/kg | 315                                           | 123                         | 72.6                              | 69.6                     | 66.4                | 46.4               | 70.0                  | 64.1                 | 67.9                | 10.0                 | 58.4               | 21.2               |
|            | Zirconium (Zr)       | mg/kg | -                                             | -                           | 7.2                               | 15.1                     | 7.8                 | 5.0                | 9.1                   | 6.8                  | 15.4                | 2.0                  | 8.6                | 4.6                |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD5**

 Indicates parameter concentration above the AEMP Benchmark.

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life probable effects level (PEL; CCME 2015) except α (Ontario Provincial Sediment Quality Guideline [PSQG] severe effect level [SEL]; OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG] probable effects

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsic (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Northwest.

**Table D.26: Statistical Comparison of Sediment Physical Properties Between Sheardown Lake NW and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results          |                |                                       |         | Summary Statistics |                   |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|-------------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size ( n ) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                            | log10          | NO                                    | 0.397   | Reference          | 5                 | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 40.5 | 24.6               | 9.3            | 20.1    | 93.0    |
|                             | Silt-Sized Material (%)                | M-W                               | rank           | NO                                    | 0.149   | Reference          | 5                 | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 48.6 | 20.5               | 7.7            | 6.4     | 67.1    |
|                             | Clay-Sized Material (%)                | M-W                               | rank           | NO                                    | 0.149   | Reference          | 5                 | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 10.9 | 4.7                | 1.8            | 1.0     | 14.8    |
|                             | Moisture (%)                           | M-W                               | rank           | YES                                   | 0.015   | Reference          | 5                 | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 70.0 | 19.3               | 7.3            | 27.4    | 84.3    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.035   | Reference          | 5                 | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 2.5  | 1.4                | 0.5            | 0.2     | 4.3     |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | tequal                            | none           | NO                                    | 0.154   | Reference          | 5                 | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 17.2 | 9.3                | 3.5            | 8.5     | 35.3    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | NO                                    | 0.211   | Reference          | 5                 | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 68.2 | 9.8                | 3.7            | 49.3    | 78.9    |
|                             | Clay-Sized Material (%)                | M-W                               | rank           | YES                                   | 0.073   | Reference          | 5                 | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 14.6 | 3.3                | 1.2            | 8.8     | 17.2    |
|                             | Moisture (%)                           | M-W                               | rank           | YES                                   | 0.003   | Reference          | 5                 | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 65.6 | 7.3                | 2.8            | 49.9    | 70.9    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.001   | Reference          | 5                 | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                                   |                |                                       |         | Sheardown NW       | 7                 | 1.4  | 0.5                | 0.2            | 0.4     | 2.0     |

 Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table D.27: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake NW and Reference Lake 3 2020 Data, and between Sheardown Lake NW 2020 and Baseline Data, Mary River Project CREMP, 2020**

| Parameter       | Sheardown Lake NW versus Reference Lake 3 in 2020 |                        |                                     |                        | Sheardown Lake NW 2020 versus Baseline Period    |                        |                                                  |                        |
|-----------------|---------------------------------------------------|------------------------|-------------------------------------|------------------------|--------------------------------------------------|------------------------|--------------------------------------------------|------------------------|
|                 | Littoral Stations                                 |                        | Profundal Stations                  |                        | Littoral Stations                                |                        | Profundal Stations                               |                        |
|                 | Reference Lake Concentration (µg/g)               | Magnitude of Elevation | Reference Lake Concentration (µg/g) | Magnitude of Elevation | Sheardown Lake NW Baseline Concentration (mg/kg) | Magnitude of Elevation | Sheardown Lake NW Baseline Concentration (mg/kg) | Magnitude of Elevation |
| Aluminum (Al)   | 16,880                                            | 0.9                    | 21,800                              | 0.9                    | 11,792                                           | 1.3                    | 17,745                                           | 1.2                    |
| Antimony (Sb)   | <0.10                                             | 1.0                    | <0.10                               | 1.0                    | 1.0                                              | 0.1                    | 1.0                                              | 0.1                    |
| Arsenic (As)    | 3.53                                              | 1.1                    | 4.07                                | 0.9                    | 2.95                                             | 1.4                    | 3.20                                             | 1.2                    |
| Barium (Ba)     | 117                                               | 0.7                    | 122                                 | 0.9                    | 78.1                                             | 1.1                    | 93.2                                             | 1.2                    |
| Beryllium (Be)  | 0.65                                              | 1.4                    | 0.80                                | 1.2                    | 1.0                                              | 0.9                    | 1.0                                              | 1.0                    |
| Bismuth (Bi)    | <0.20                                             | 1.2                    | <0.20                               | 1.2                    | -                                                | -                      | -                                                | -                      |
| Boron (B)       | 12.2                                              | 2.1                    | 14.7                                | 2.0                    | 2.86                                             | 9.0                    | 3.11                                             | 9.6                    |
| Cadmium (Cd)    | 0.173                                             | 1.5                    | 0.148                               | 1.7                    | 0.500                                            | 0.5                    | 0.500                                            | 0.5                    |
| Calcium (Ca)    | 5,608                                             | 0.7                    | 5,010                               | 0.9                    | 2,697                                            | 1.5                    | 3,558                                            | 1.2                    |
| Chromium (Cr)   | 54.3                                              | 1.1                    | 65.0                                | 1.1                    | 52.8                                             | 1.1                    | 81.0                                             | 0.9                    |
| Cobalt (Co)     | 10.8                                              | 1.1                    | 15.2                                | 1.0                    | 10.4                                             | 1.1                    | 15.5                                             | 1.0                    |
| Copper (Cu)     | 71.4                                              | 0.5                    | 83.8                                | 0.5                    | 32.6                                             | 1.2                    | 48.3                                             | 0.9                    |
| Iron (Fe)       | 50,600                                            | 0.8                    | 45,080                              | 1.0                    | 28,120                                           | 1.5                    | 40,382                                           | 1.1                    |
| Lead (Pb)       | 13.8                                              | 1.2                    | 16.7                                | 1.2                    | 12.7                                             | 1.3                    | 20.1                                             | 1.0                    |
| Lithium (Li)    | 26.0                                              | 1.1                    | 33.7                                | 1.0                    | -                                                | -                      | -                                                | -                      |
| Magnesium (Mg)  | 11,440                                            | 0.9                    | 14,180                              | 0.9                    | 7,448                                            | 1.3                    | 11,498                                           | 1.1                    |
| Manganese (Mn)  | 579                                               | 0.9                    | 1,230                               | 4.3                    | 756                                              | 0.7                    | 2,164                                            | 2.4                    |
| Mercury (Hg)    | 0.0500                                            | 0.6                    | 0.0583                              | 0.6                    | 0.100                                            | 0.3                    | 0.100                                            | 0.3                    |
| Molybdenum (Mo) | 4.44                                              | 0.7                    | 2.52                                | 2.1                    | 3.40                                             | 0.9                    | 3.55                                             | 1.5                    |
| Nickel (Ni)     | 40.0                                              | 1.4                    | 45.0                                | 1.4                    | 49.3                                             | 1.1                    | 68.9                                             | 0.9                    |
| Phosphorus (P)  | 1,167                                             | 0.7                    | 956                                 | 0.9                    | 863                                              | 1.0                    | 1,400                                            | 0.6                    |
| Potassium (K)   | 4,100                                             | 1.0                    | 5,338                               | 1.0                    | 2,681                                            | 1.6                    | 4,612                                            | 1.1                    |
| Selenium (Se)   | 0.73                                              | 0.5                    | 0.61                                | 0.5                    | 1.0                                              | 0.4                    | 1.0                                              | 0.3                    |
| Silver (Ag)     | 0.14                                              | 1.1                    | 0.20                                | 0.8                    | 0.27                                             | 0.6                    | 0.30                                             | 0.5                    |
| Sodium (Na)     | 304                                               | 0.8                    | 369                                 | 0.8                    | 249                                              | 0.9                    | 342                                              | 0.8                    |
| Strontium (Sr)  | 11.6                                              | 0.8                    | 12.3                                | 0.9                    | 7.20                                             | 1.3                    | 11.4                                             | 1.0                    |
| Sulphur (S)     | 1,400                                             | 0.7                    | 1,140                               | 0.9                    | -                                                | -                      | -                                                | -                      |
| Thallium (Tl)   | 0.379                                             | 1.1                    | 0.594                               | 0.9                    | 1.0                                              | 0.4                    | 1.0                                              | 0.5                    |
| Tin (Sn)        | <2.0                                              | 1.0                    | <2.0                                | 1.0                    | -                                                | -                      | -                                                | -                      |
| Titanium (Ti)   | 1,006                                             | 0.9                    | 1,136                               | 1.1                    | -                                                | -                      | -                                                | -                      |
| Uranium (U)     | 11.0                                              | 0.6                    | 19.7                                | 0.3                    | -                                                | -                      | -                                                | -                      |
| Vanadium (V)    | 54.1                                              | 0.8                    | 63.4                                | 0.9                    | 37.4                                             | 1.2                    | 57.9                                             | 1.0                    |
| Zinc (Zn)       | 73.1                                              | 0.7                    | 83.8                                | 0.8                    | 51.1                                             | 1.0                    | 76.0                                             | 0.8                    |
| Zirconium (Zr)  | 4.5                                               | 2.2                    | 3.9                                 | 1.8                    | -                                                | -                      | -                                                | -                      |

 Denotes slight elevation (concentration 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).  
 Denotes moderate elevation (concentration 5 to 10 times higher than mean reference area value or baseline period value, as applicable).  
 Denotes high elevation (concentration is ≥ 10 times higher than mean reference area value or baseline period value, as applicable).

Note: '-' indicates baseline data not available.

**Table D.28: Field Observations of Sediment Properties at Sheardown Lake Southeast (DLO-02) Benthic Stations<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station   | Station Depth (m) | Colour and Texture Observations                                                               | Evidence of Anoxia <sup>b</sup> | Plant or Algal Presence         |
|-----------|-------------------|-----------------------------------------------------------------------------------------------|---------------------------------|---------------------------------|
| DLO-02-11 | 7.0               | brown silt overlying dark grey silt-clay; some organics present                               | none detected                   | none observed                   |
| DLO-02-10 | 7.0               | brown silt overlying dark grey silt-clay; some organics present                               | none detected                   | none observed                   |
| DLO-02-4  | 8.0               | brown silt overlying dark grey silt-clay                                                      | none detected                   | none observed                   |
| DLO-02-9  | 8.5               | light brown silt overlying grey silt-clay                                                     | none detected                   | none observed                   |
| DLO-02-1  | 12.1              | reddish brown thin layer at surface; medium brown compact silt with some fine sand intermixed | none detected                   | sparse algae (mare's eggs)      |
| DLO-02-12 | 11.0              | brown silt overlying dark grey silt-clay                                                      | none detected                   | none observed                   |
| DLO-02-8  | 13.0              | brown silt overlying grey silt-clay                                                           | none detected                   | sparse algae                    |
| DLO-02-13 | 11.0              | brown silt overlying grey silt-clay                                                           | none detected                   | sparse algae                    |
| DLO-02-2  | 15.0              | brown silt overlying dark grey silt-clay; some organics present                               | none detected                   | sparse algae                    |
| DLO-02-3  | 13.2              | reddish brown thin layer over medium brown to grey-brown compact silt                         | none detected                   | sparse macrophytes (bryophytes) |

<sup>a</sup> Sediment particle size and benthic invertebrate community samples were collected using a petite-Ponar.

<sup>b</sup> Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

**Table D.29: Observations from Sediment Cores Collected at Sheardown Lake Southeast (DLO-02), Mary River Project CREMP, August 2020**

| Sample Station | Station Depth (m) | Station Type | Core Number | Core Length (cm) | Surficial Substrate Texture Description                               |
|----------------|-------------------|--------------|-------------|------------------|-----------------------------------------------------------------------|
| DLO-02-1       | 11.5              | Littoral     | 1           | 7.5              | reddish oxidized silt overlying grey brown silt; some black streaking |
|                |                   |              | 2           | 11.0             |                                                                       |
|                |                   |              | 3           | 11.0             |                                                                       |
|                |                   |              | 4           | 11.0             |                                                                       |
| DLO-02-11      | 7.0               | Littoral     | 1           | 18.5             | brown silt flocc overlying compact grey silt containing some clay     |
|                |                   |              | 2           | 15.0             |                                                                       |
|                |                   |              | 3           | 15.5             |                                                                       |
|                |                   |              | 4           | 11.5             |                                                                       |
| DLO-02-4       | 8.8               | Littoral     | 1           | 13.0             | brown silt flocc overlying compact grey silt containing some clay     |
|                |                   |              | 2           | 13.5             |                                                                       |
|                |                   |              | 3           | 19.5             |                                                                       |
|                |                   |              | 4           | 12.0             |                                                                       |
| DLO-02-2       | 15.4              | Profundal    | 1           | 7.0              | brown silt flocc overlying compact grey silt containing some clay     |
|                |                   |              | 2           | 12.5             |                                                                       |
|                |                   |              | 3           | 8.0              |                                                                       |
|                |                   |              | 4           | 9.0              |                                                                       |
| DLO-02-3       | 13.0              | Profundal    | 1           | 14.0             | red-brown silt overlying grey-brown to dark grey-brown silt           |
|                |                   |              | 2           | 15.0             |                                                                       |
|                |                   |              | 3           | 20.0             |                                                                       |
|                |                   |              | 4           | 18.0             |                                                                       |

**Table D.30: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Sheardown Lake Southeast (DLO-02) Sediment Stations, Mary River Project CREMP, August 2020**

| Parameter  |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Sheardown Lake Southeast Basin Station |               |               |               |               | Summary Statistics |                    |                |
|------------|----------------------|-------|-----------------------------------------------|-----------------------------|----------------------------------------|---------------|---------------|---------------|---------------|--------------------|--------------------|----------------|
|            |                      |       |                                               |                             | DLO-02-1                               | DLO-02-11     | DLO-02-4      | DLO-02-2      | DLO-02-3      | Mean               | Standard Deviation | Standard Error |
|            |                      |       |                                               |                             | (littoral)                             | (littoral)    | (littoral)    | (profundal)   | (profundal)   |                    |                    |                |
| Non-metals | Sand                 | %     | -                                             | -                           | 21.6                                   | 5.2           | 6.7           | 20.7          | 20.3          | 14.9               | 8.20               | 3.67           |
|            | Silt                 | %     | -                                             | -                           | 68.9                                   | 77.4          | 77.8          | 69.8          | 67.5          | 72.3               | 4.93               | 2.20           |
|            | Clay                 | %     | -                                             | -                           | 9.4                                    | 17.5          | 15.5          | 9.5           | 12.2          | 12.8               | 3.61               | 1.62           |
|            | Moisture             | %     | -                                             | -                           | 48.9                                   | 62.6          | 63.7          | 49.0          | 41.9          | 53.2               | 9.52               | 4.26           |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | -                           | 1.89                                   | 0.39          | 0.74          | 1.39          | 0.92          | 1.07               | 0.585              | 0.262          |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | -                           | 16,200                                 | 17,600        | 18,400        | 16,200        | 18,900        | 17,460             | 1,240              | 555            |
|            | Antimony (Sb)        | mg/kg | -                                             | -                           | <0.10                                  | <0.10         | <0.10         | <0.10         | <0.10         | <0.10              | 0                  | 0              |
|            | Arsenic (As)         | mg/kg | 17                                            | 5.9                         | 3.48                                   | 3.49          | 4.05          | 3.11          | 2.94          | 3.41               | 0.428              | 0.191          |
|            | Barium (Ba)          | mg/kg | -                                             | -                           | 74.2                                   | 94.6          | 106           | 68.2          | 79.8          | 84.6               | 15.5               | 6.92           |
|            | Beryllium (Be)       | mg/kg | -                                             | -                           | 0.81                                   | 0.84          | 0.96          | 0.78          | 0.89          | 0.86               | 0.071              | 0.032          |
|            | Bismuth (Bi)         | mg/kg | -                                             | -                           | 0.21                                   | 0.27          | 0.25          | <0.20         | 0.23          | 0.23               | 0.029              | 0.013          |
|            | Boron (B)            | mg/kg | -                                             | -                           | 20.4                                   | 20.4          | 26.2          | 22.3          | 19.3          | 21.7               | 2.73               | 1.22           |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 1.5                         | 0.091                                  | 0.112         | 0.104         | 0.079         | 0.101         | 0.097              | 0.013              | 0.0057         |
|            | Calcium (Ca)         | mg/kg | -                                             | -                           | 6,540                                  | 9,250         | 7,200         | 5,870         | 6,110         | 6,994              | 1,359              | 607.6          |
|            | Chromium (Cr)        | mg/kg | 90                                            | 79                          | 69.3                                   | <b>86.5</b>   | <b>83.2</b>   | 74.0          | 70.5          | 76.7               | 7.73               | 3.46           |
|            | Cobalt (Co)          | mg/kg | -                                             | -                           | 13.4                                   | 13.9          | 13.9          | 12.6          | 14.0          | 13.6               | 0.586              | 0.262          |
|            | Copper (Cu)          | mg/kg | 110                                           | 56                          | 25.6                                   | 29.7          | 29.3          | 24.2          | 27.9          | 27.3               | 2.38               | 1.06           |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 34,400                      | <b>49,500</b>                          | <b>36,900</b> | <b>41,800</b> | <b>37,000</b> | <b>46,900</b> | <b>42,420</b>      | 5,710              | 2,554          |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 35                          | 15.2                                   | 18.0          | 18.9          | 14.5          | 16.3          | 16.6               | 1.85               | 0.828          |
|            | Lithium (Li)         | mg/kg | -                                             | -                           | 30.6                                   | 33.0          | 34.3          | 30.5          | 33.9          | 32.5               | 1.81               | 0.808          |
|            | Magnesium (Mg)       | mg/kg | -                                             | -                           | 13,600                                 | 17,700        | 14,900        | 12,800        | 14,800        | 14,760             | 1,861              | 832            |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 657                         | <b>698</b>                             | <b>978</b>    | <b>1,100</b>  | 645           | 559           | <b>796</b>         | 231                | 103            |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.17                        | 0.0217                                 | 0.0218        | 0.0210        | 0.0162        | 0.0245        | 0.0210             | 0.00302            | 0.00135        |
|            | Molybdenum (Mo)      | mg/kg | -                                             | -                           | 1.78                                   | 1.22          | 1.49          | 1.27          | 1.53          | 1.46               | 0.225              | 0.100          |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 66                          | 52.0                                   | <b>69.0</b>   | 63.0          | 56.4          | 51.9          | 58.5               | 7.43               | 3.32           |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,278                       | 1,020                                  | 942           | 1,050         | 946           | 912           | 974                | 58                 | 26             |
|            | Potassium (K)        | mg/kg | -                                             | -                           | 4,060                                  | 4,250         | 4,720         | 4,050         | 5,080         | 4,432              | 453                | 203            |
|            | Selenium (Se)        | mg/kg | -                                             | -                           | 0.21                                   | <0.20         | <0.20         | <0.20         | 0.21          | 0.20               | 0.0055             | 0.0024         |
|            | Silver (Ag)          | mg/kg | -                                             | -                           | 0.11                                   | 0.12          | 0.12          | 0.11          | 0.13          | 0.12               | 0.0084             | 0.0037         |
|            | Sodium (Na)          | mg/kg | -                                             | -                           | 247                                    | 282           | 308           | 270           | 251           | 272                | 24.8               | 11.1           |
|            | Strontium (Sr)       | mg/kg | -                                             | -                           | 10.3                                   | 12.0          | 12.8          | 11.2          | 10.1          | 11.3               | 1.14               | 0.509          |
|            | Sulphur (S)          | mg/kg | -                                             | -                           | <1,000                                 | <1,000        | <1,000        | <1,000        | <1,000        | <1,000             | 0                  | 0              |
|            | Thallium (Tl)        | mg/kg | -                                             | -                           | 0.349                                  | 0.432         | 0.465         | 0.338         | 0.389         | 0.395              | 0.0540             | 0.0242         |
|            | Tin (Sn)             | mg/kg | -                                             | -                           | <2.0                                   | <2.0          | <2.0          | <2.0          | <2.0          | <2.0               | 0                  | 0              |
|            | Titanium (Ti)        | mg/kg | -                                             | -                           | 1,220                                  | 1,300         | 1,390         | 1,290         | 1,290         | 1,298              | 60.6               | 27.1           |
|            | Uranium (U)          | mg/kg | -                                             | -                           | 5.22                                   | 4.54          | 5.34          | 4.39          | 5.32          | 4.96               | 0.459              | 0.205          |
|            | Vanadium (V)         | mg/kg | -                                             | -                           | 46.6                                   | 52.1          | 54.3          | 47.1          | 49.4          | 49.9               | 3.29               | 1.47           |
|            | Zinc (Zn)            | mg/kg | 315                                           | 135                         | 56.1                                   | 56.3          | 59.4          | 50.2          | 59.3          | 56.3               | 3.74               | 1.67           |
|            | Zirconium (Zr)       | mg/kg | -                                             | -                           | 15.7                                   | 18.0          | 19.2          | 16.6          | 19.1          | 17.7               | 1.54               | 0.689          |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD**

 Indicates parameter concentration above the AEMP Benchmark.

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life probable effects level (PEL; CCME 2015) except α (Ontario Provincial Sediment Quality Guideline [PSQG] severe effect level [SEL]; OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG] probable effects level [PEL; BCMOE 2015]).

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Sheardown Lake Southeast.



**Table D.31: Statistical Comparison of Sediment Physical Properties Between Sheardown Lake SE and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results          |                |                                       |         | Summary Statistics |                   |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|-------------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size ( n ) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                            | log10          | YES                                   | 0.004   | Reference          | 5                 | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 11.1 | 6.7                | 3.0            | 5.2     | 21.6    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | YES                                   | 0.009   | Reference          | 5                 | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 75.0 | 5.5                | 2.5            | 68.9    | 81.5    |
|                             | Clay-Sized Material (%)                | tequal                            | none           | YES                                   | 0.029   | Reference          | 5                 | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 13.9 | 3.7                | 1.7            | 9.4     | 17.5    |
|                             | Moisture (%)                           | tequal                            | none           | YES                                   | 0.001   | Reference          | 5                 | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 60.9 | 7.3                | 3.3            | 48.9    | 68.6    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.008   | Reference          | 5                 | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 1.4  | 0.8                | 0.4            | 0.4     | 2.3     |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | tequal                            | none           | NO                                    | 0.146   | Reference          | 5                 | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 15.1 | 5.3                | 2.4            | 8.3     | 20.7    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | NO                                    | 0.112   | Reference          | 5                 | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 72.2 | 4.0                | 1.8            | 67.5    | 76.6    |
|                             | Clay-Sized Material (%)                | tequal                            | none           | NO                                    | 0.477   | Reference          | 5                 | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 12.7 | 2.8                | 1.2            | 9.5     | 15.6    |
|                             | Moisture (%)                           | tequal                            | none           | YES                                   | 0.001   | Reference          | 5                 | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 55.8 | 11.8               | 5.3            | 41.9    | 70.7    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.002   | Reference          | 5                 | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                                   |                |                                       |         | Sheardown SE       | 5                 | 1.1  | 0.6                | 0.2            | 0.2     | 1.6     |

Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table D.32: Magnitude of Elevation in Sediment Metal Concentrations between Sheardown Lake SE and Reference Lake 3 2020 Data, and between Sheardown Lake SE 2020 and Baseline Data, Mary River Project CREMP, 2020**

| Parameter       | Sheardown Lake SE versus Reference Lake 3 in 2020 |                        |                                     |                        | Sheardown Lake SE 2020 versus Baseline Period    |                        |                                                  |                        |
|-----------------|---------------------------------------------------|------------------------|-------------------------------------|------------------------|--------------------------------------------------|------------------------|--------------------------------------------------|------------------------|
|                 | Littoral Stations                                 |                        | Profundal Stations                  |                        | Littoral Stations                                |                        | Profundal Stations                               |                        |
|                 | Reference Lake Concentration (µg/g)               | Magnitude of Elevation | Reference Lake Concentration (µg/g) | Magnitude of Elevation | Sheardown Lake SE Baseline Concentration (mg/kg) | Magnitude of Elevation | Sheardown Lake SE Baseline Concentration (mg/kg) | Magnitude of Elevation |
| Aluminum (Al)   | 16,880                                            | 1.0                    | 21,800                              | 0.8                    | 14,950                                           | 1.2                    | 13,133                                           | 1.3                    |
| Antimony (Sb)   | <0.10                                             | 1.0                    | <0.10                               | 1.0                    | 1.0                                              | 0.1                    | 1.0                                              | 0.1                    |
| Arsenic (As)    | 3.53                                              | 1.0                    | 4.07                                | 0.7                    | 1.85                                             | 2.0                    | 1.53                                             | 2.0                    |
| Barium (Ba)     | 117                                               | 0.8                    | 122                                 | 0.6                    | 80.5                                             | 1.1                    | 64.3                                             | 1.2                    |
| Beryllium (Be)  | 0.65                                              | 1.3                    | 0.80                                | 1.0                    | 1.0                                              | 0.9                    | 1.0                                              | 0.8                    |
| Bismuth (Bi)    | <0.20                                             | 1.2                    | <0.20                               | 1.1                    | -                                                | -                      | -                                                | -                      |
| Boron (B)       | 12.2                                              | 1.8                    | 14.7                                | 1.4                    | 2.50                                             | 8.9                    | 1.35                                             | 15.4                   |
| Cadmium (Cd)    | 0.173                                             | 0.6                    | 0.148                               | 0.6                    | 0.500                                            | 0.2                    | 0.625                                            | 0.1                    |
| Calcium (Ca)    | 5,608                                             | 1.4                    | 5,010                               | 1.2                    | 6,310                                            | 1.2                    | 8,925                                            | 0.7                    |
| Chromium (Cr)   | 54.3                                              | 1.5                    | 65.0                                | 1.1                    | 78.0                                             | 1.0                    | 72.3                                             | 1.0                    |
| Cobalt (Co)     | 10.8                                              | 1.3                    | 15.2                                | 0.9                    | 12.5                                             | 1.1                    | 12.0                                             | 1.1                    |
| Copper (Cu)     | 71.4                                              | 0.4                    | 83.8                                | 0.3                    | 29.5                                             | 1.0                    | 24.5                                             | 1.1                    |
| Iron (Fe)       | 50,600                                            | 0.8                    | 45,080                              | 0.9                    | 32,284                                           | 1.3                    | 29,117                                           | 1.4                    |
| Lead (Pb)       | 13.8                                              | 1.3                    | 16.7                                | 0.9                    | 17.0                                             | 1.0                    | 13.8                                             | 1.1                    |
| Lithium (Li)    | 26.0                                              | 1.3                    | 33.7                                | 1.0                    | -                                                | -                      | -                                                | -                      |
| Magnesium (Mg)  | 11,440                                            | 1.3                    | 14,180                              | 1.0                    | 12,634                                           | 1.2                    | 13,742                                           | 1.0                    |
| Manganese (Mn)  | 579                                               | 1.6                    | 1,230                               | 0.5                    | 462                                              | 2.0                    | 410                                              | 1.5                    |
| Mercury (Hg)    | 0.0500                                            | 0.4                    | 0.0583                              | 0.3                    | 0.100                                            | 0.2                    | 0.100                                            | 0.2                    |
| Molybdenum (Mo) | 4.44                                              | 0.3                    | 2.52                                | 0.6                    | 1.5                                              | 1.0                    | 1.0                                              | 1.4                    |
| Nickel (Ni)     | 40.0                                              | 1.5                    | 45.0                                | 1.2                    | 61.5                                             | 1.0                    | 62.0                                             | 0.9                    |
| Phosphorus (P)  | 1,167                                             | 0.9                    | 956                                 | 1.0                    | 1,150                                            | 0.9                    | 950                                              | 1.0                    |
| Potassium (K)   | 4,100                                             | 1.1                    | 5,338                               | 0.9                    | 3,947                                            | 1.1                    | 3,317                                            | 1.4                    |
| Selenium (Se)   | 0.73                                              | 0.3                    | 0.61                                | 0.3                    | 1.0                                              | 0.2                    | 1.0                                              | 0.2                    |
| Silver (Ag)     | 0.14                                              | 0.8                    | 0.20                                | 0.6                    | 0.42                                             | 0.3                    | 0.31                                             | 0.4                    |
| Sodium (Na)     | 304                                               | 0.9                    | 369                                 | 0.7                    | 353                                              | 0.8                    | 330                                              | 0.8                    |
| Strontium (Sr)  | 11.6                                              | 1.0                    | 12.3                                | 0.9                    | 16.0                                             | 0.7                    | 11.0                                             | 1.0                    |
| Sulphur (S)     | 1,400                                             | 0.7                    | 1,140                               | 0.9                    | -                                                | -                      | -                                                | -                      |
| Thallium (Tl)   | 0.379                                             | 1.1                    | 0.594                               | 0.6                    | 1.0                                              | 0.4                    | 1.0                                              | 0.4                    |
| Tin (Sn)        | <2.0                                              | 1.0                    | <2.0                                | 1.0                    | -                                                | -                      | -                                                | -                      |
| Titanium (Ti)   | 1,006                                             | 1.3                    | 1,136                               | 1.1                    | -                                                | -                      | -                                                | -                      |
| Uranium (U)     | 11.0                                              | 0.5                    | 19.7                                | 0.2                    | -                                                | -                      | -                                                | -                      |
| Vanadium (V)    | 54.1                                              | 0.9                    | 63.4                                | 0.8                    | 52.0                                             | 1.0                    | 44.3                                             | 1.1                    |
| Zinc (Zn)       | 73.1                                              | 0.8                    | 83.8                                | 0.7                    | 51.0                                             | 1.1                    | 50.8                                             | 1.1                    |
| Zirconium (Zr)  | 4.5                                               | 3.9                    | 3.9                                 | 4.5                    | -                                                | -                      | -                                                | -                      |

 Denotes slight elevation (concentration 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).  
 Denotes moderate elevation (concentration 5 to 10 times higher than mean reference area value or baseline period value, as applicable).  
 Denotes high elevation (concentration is ≥ 10 times higher than mean reference area value or baseline period value, as applicable).

Note: '-' indicates baseline data not available.

**Table D.33: Deposited Sediment Field Sampling Observations at Mary River Study Areas<sup>a</sup>, Mary River Project CREMP, August 2020**

| Study Area                       | Station | Texture of Collected Sediment         | Silt Presence <sup>b</sup>                               |
|----------------------------------|---------|---------------------------------------|----------------------------------------------------------|
| <b>GO-09 Upstream Reference</b>  | GO-09-1 | medium (sized) coarse sand and gravel | precipitate and deposits (<1 mm )                        |
|                                  | GO-09-3 | medium (sized) coarse sand and gravel | precipitate and deposits (<1 mm )                        |
|                                  | GO-09-5 | medium (sized) coarse sand and gravel | precipitate and deposits (<1 mm )                        |
| <b>GO-03 Upstream</b>            | GO-03-1 | medium (sized) coarse sand and gravel | none observed                                            |
|                                  | GO-03-3 | coarse sand and gravel                | none observed                                            |
|                                  | GO-03-5 | coarse sand and gravel                | none observed                                            |
| <b>EO-01 Upper Mine-Exposed</b>  | EO-01-1 | gravel                                | none observed                                            |
|                                  | EO-01-3 | gravel and coarse sand                | none observed                                            |
|                                  | EO-01-5 | medium (sized) coarse sand            | none observed                                            |
| <b>EO-20 Middle Mine-Exposed</b> | EO-20-1 | medium (sized) coarse sand            | precipitate and deposits (<1 mm complex with periphyton) |
|                                  | EO-20-3 | medium (sized) coarse sand            | none observed                                            |
|                                  | EO-20-5 | medium (sized) coarse sand            | none observed                                            |
| <b>CO-05 Lower Mine-Exposed</b>  | CO-05-1 | medium (sized) coarse sand            | none observed                                            |
|                                  | CO-05-3 | medium (sized) coarse sand            | none observed                                            |
|                                  | CO-05-5 | medium (sized) coarse sand            | none observed                                            |

<sup>a</sup> Sediment samples collected using a stainless steel scoop directly from the streambed or shoreline, as available.

<sup>b</sup> Silt observations described as fine material present on the surface of in-stream substrate and/or as interstitial deposits, occurring unusually.

**Table D.34: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River GO-09 Reference Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Mary River GO-09 Reference Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|------------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | GO-09-B1                           | GO-09-B3 | GO-09-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.12                               | <0.10    | 0.12     | 0.11                          | 0.012              | 0.0067         |
| Aluminum (Al)        | µg/g  | -                    | 3,930                              | 1,650    | 2,690    | 2,757                         | 1,141              | 659            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                              | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.45                               | 0.26     | 0.43     | 0.38                          | 0.10               | 0.060          |
| Barium (Ba)          | µg/g  | -                    | 17.7                               | 7.61     | 12.4     | 12.6                          | 5.05               | 2.91           |
| Beryllium (Be)       | µg/g  | -                    | 0.18                               | <0.10    | 0.13     | 0.14                          | 0.040              | 0.023          |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                              | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | 6.3                                | <5.0     | <5.0     | 5.4                           | 0.75               | 0.43           |
| Cadmium (Cd)         | µg/g  | 3.5                  | <0.020                             | <0.020   | <0.020   | <0.020                        | 0                  | 0              |
| Calcium (Ca)         | µg/g  | -                    | 3,540                              | 1,780    | 2,930    | 2,750                         | 894                | 516            |
| Chromium (Cr)        | µg/g  | 90                   | 16.8                               | 8.68     | 15.4     | 13.6                          | 4.34               | 2.51           |
| Cobalt (Co)          | µg/g  | -                    | 3.09                               | 1.59     | 2.53     | 2.40                          | 0.758              | 0.438          |
| Copper (Cu)          | µg/g  | 197                  | 7.18                               | 2.28     | 3.90     | 4.45                          | 2.50               | 1.44           |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 11,400                             | 8,490    | 13,300   | 11,063                        | 2,423              | 1,399          |
| Lead (Pb)            | µg/g  | 91.3                 | 3.96                               | 2.25     | 3.01     | 3.07                          | 0.857              | 0.495          |
| Lithium (Li)         | µg/g  | -                    | 7.4                                | 2.9      | 4.8      | 5.0                           | 2.3                | 1.3            |
| Magnesium (Mg)       | µg/g  | -                    | 4,060                              | 1,640    | 2,730    | 2,810                         | 1,212              | 700            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 104                                | 45.4     | 77.8     | 75.7                          | 29.4               | 16.9           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                            | <0.0050  | <0.0050  | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.14                               | <0.10    | <0.10    | 0.11                          | 0.023              | 0.013          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 8.04                               | 4.06     | 6.22     | 6.11                          | 1.99               | 1.15           |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 371                                | 223      | 456      | 350                           | 118                | 68             |
| Potassium (K)        | µg/g  | -                    | 1,080                              | 440      | 730      | 750                           | 320                | 185            |
| Selenium (Se)        | µg/g  | -                    | <0.20                              | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                              | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | 91                                 | <50      | 64       | 68                            | 21                 | 12             |
| Strontium (Sr)       | µg/g  | -                    | 5.61                               | 3.62     | 4.92     | 4.72                          | 1.01               | 0.583          |
| Sulphur (S)          | µg/g  | -                    | <1,000                             | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.093                              | <0.050   | 0.060    | 0.068                         | 0.023              | 0.013          |
| Tin (Sn)             | µg/g  | -                    | <2.0                               | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 472                                | 226      | 362      | 353                           | 123                | 71             |
| Uranium (U)          | µg/g  | -                    | 1.22                               | 0.625    | 0.922    | 0.922                         | 0.298              | 0.172          |
| Vanadium (V)         | µg/g  | -                    | 20.4                               | 14.0     | 24.0     | 19.5                          | 5.06               | 2.92           |
| Zinc (Zn)            | µg/g  | 315                  | 14.5                               | 5.90     | 10.6     | 10.3                          | 4.31               | 2.49           |
| Zirconium (Zr)       | µg/g  | -                    | 7.8                                | 3.9      | 5.6      | 5.8                           | 2.0                | 1.1            |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQF) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.35: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River GO-03 Upstream Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Mary River GO-03 Upstream Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|-----------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | GO-03-B1                          | GO-03-B3 | GO-03-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>a</sup>      | <0.10                             | 0.12     | <0.10    | 0.11                          | 0.012              | 0.0067         |
| Aluminum (Al)        | µg/g  | -                    | 1,480                             | 2,780    | 1,740    | 2,000                         | 688                | 397            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                             | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.400                             | 0.470    | 2.42     | 1.10                          | 1.15               | 0.662          |
| Barium (Ba)          | µg/g  | -                    | 7.35                              | 12.9     | 7.92     | 9.4                           | 3.05               | 1.76           |
| Beryllium (Be)       | µg/g  | -                    | <0.10                             | 0.14     | <0.10    | <0.10                         | 0                  | 0              |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                             | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                              | <5.0     | <5.0     | <5.0                          | 0                  | 0              |
| Cadmium (Cd)         | µg/g  | 3.5                  | <0.020                            | <0.020   | <0.020   | <0.020                        | 0                  | 0              |
| Calcium (Ca)         | µg/g  | -                    | 2,350                             | 2,030    | 1,860    | 2,080                         | 249                | 144            |
| Chromium (Cr)        | µg/g  | 90                   | 13.1                              | 17.5     | 10.6     | 13.7                          | 3.49               | 2.02           |
| Cobalt (Co)          | µg/g  | -                    | 1.67                              | 2.50     | 1.71     | 1.96                          | 0.468              | 0.270          |
| Copper (Cu)          | µg/g  | 197                  | 2.07                              | 3.93     | 2.34     | 2.78                          | 1.01               | 0.580          |
| Iron (Fe)            | µg/g  | 40,000 <sup>a</sup>  | 13,000                            | 17,000   | 10,900   | 13,633                        | 3,099              | 1,789          |
| Lead (Pb)            | µg/g  | 91.3                 | 2.37                              | 3.39     | 2.45     | 2.74                          | 0.567              | 0.327          |
| Lithium (Li)         | µg/g  | -                    | 2.7                               | 4.8      | 2.9      | <2.0                          | 1.2                | 0.67           |
| Magnesium (Mg)       | µg/g  | -                    | 1,610                             | 2,240    | 1,530    | 1,793                         | 389                | 225            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>a,β</sup> | 47.7                              | 74.8     | 53.3     | 58.6                          | 14.3               | 8.26           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                           | <0.0050  | 0.0051   | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | <0.10                             | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Nickel (Ni)          | µg/g  | 75 <sup>a,β</sup>    | 4.22                              | 6.12     | 4.15     | 4.83                          | 1.12               | 0.645          |
| Phosphorus (P)       | µg/g  | 2,000 <sup>a</sup>   | 458                               | 369      | 372      | 400                           | 51                 | 29             |
| Potassium (K)        | µg/g  | -                    | 360                               | 720      | 440      | 507                           | 189                | 109            |
| Selenium (Se)        | µg/g  | -                    | <0.20                             | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                             | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                               | 65       | 50       | 55                            | 8.7                | 5.0            |
| Strontium (Sr)       | µg/g  | -                    | 3.78                              | 4.13     | 4.05     | 3.99                          | 0.183              | 0.106          |
| Sulphur (S)          | µg/g  | -                    | <1,000                            | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | <0.050                            | 0.060    | <0.050   | <0.050                        | 0                  | 0              |
| Tin (Sn)             | µg/g  | -                    | <2.0                              | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 241                               | 320      | 228      | 263                           | 50                 | 29             |
| Uranium (U)          | µg/g  | -                    | 0.732                             | 1.05     | 0.684    | 0.822                         | 0.199              | 0.115          |
| Vanadium (V)         | µg/g  | -                    | 22.8                              | 29.2     | 19.5     | 23.8                          | 4.93               | 2.85           |
| Zinc (Zn)            | µg/g  | 315                  | 6.1                               | 10.4     | 6.8      | 7.8                           | 2.3                | 1.3            |
| Zirconium (Zr)       | µg/g  | -                    | 3.4                               | 6.0      | 3.7      | 4.4                           | 1.4                | 0.82           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.36: Magnitude of Elevation in Deposited Sediment Metal Concentrations at Mary River Upper and Mine-Exposed Study Areas Compared to Reference Area Data, Mary River Project CREMP, August 2020**

| Parameter            | Units | Mary River Reference (GO-09) | Upstream (GO-03) | Upper Mine-Exposed (EO-01) | Middle Mine-Exposed (EO-20) | Lower Mine-Exposed (CO-05) |
|----------------------|-------|------------------------------|------------------|----------------------------|-----------------------------|----------------------------|
| Total Organic Carbon | %     | 0.11                         | 0.9              | 1.0                        | 1.6                         | 1.0                        |
| Aluminum (Al)        | µg/g  | 2,757                        | 0.7              | 0.9                        | 1.5                         | 0.9                        |
| Antimony (Sb)        | µg/g  | <0.10                        | 1.0              | 1.0                        | 1.0                         | 1.0                        |
| Arsenic (As)         | µg/g  | 0.38                         | 2.9              | 1.1                        | 1.6                         | 1.0                        |
| Barium (Ba)          | µg/g  | 12.6                         | 0.7              | 0.9                        | 1.6                         | 0.8                        |
| Beryllium (Be)       | µg/g  | 0.14                         | 0.8              | 0.8                        | 1.7                         | 1.0                        |
| Bismuth (Bi)         | µg/g  | <0.20                        | 1.0              | 1.2                        | 1.5                         | 1.0                        |
| Boron (B)            | µg/g  | 5.4                          | 0.9              | 0.9                        | 1.2                         | 0.9                        |
| Cadmium (Cd)         | µg/g  | <0.020                       | 1.0              | 1.3                        | 1.9                         | 1.0                        |
| Calcium (Ca)         | µg/g  | 2,750                        | 0.8              | 0.9                        | 1.0                         | 0.7                        |
| Chromium (Cr)        | µg/g  | 13.6                         | 1.0              | 1.4                        | 1.9                         | 1.0                        |
| Cobalt (Co)          | µg/g  | 2.40                         | 0.8              | 1.1                        | 1.6                         | 1.0                        |
| Copper (Cu)          | µg/g  | 4.45                         | 0.6              | 0.9                        | 1.7                         | 0.7                        |
| Iron (Fe)            | µg/g  | 11,063                       | 1.2              | 1.5                        | 1.7                         | 0.6                        |
| Lead (Pb)            | µg/g  | 3.07                         | 0.9              | 0.9                        | 1.4                         | 0.7                        |
| Lithium (Li)         | µg/g  | 5.0                          | 0.7              | 0.7                        | 1.3                         | 1.0                        |
| Magnesium (Mg)       | µg/g  | 2,810                        | 0.6              | 0.9                        | 1.6                         | 1.2                        |
| Manganese (Mn)       | µg/g  | 75.7                         | 0.8              | 1.1                        | 1.8                         | 1.0                        |
| Mercury (Hg)         | µg/g  | <0.0050                      | 1.0              | 1.0                        | 1.0                         | 1.0                        |
| Molybdenum (Mo)      | µg/g  | 0.11                         | 0.9              | 1.8                        | 3.2                         | 1.1                        |
| Nickel (Ni)          | µg/g  | 6.11                         | 0.8              | 1.4                        | 2.7                         | 2.3                        |
| Phosphorus (P)       | µg/g  | 350                          | 1.1              | 1.1                        | 1.1                         | 0.8                        |
| Potassium (K)        | µg/g  | 750                          | 0.7              | 0.8                        | 1.6                         | 0.7                        |
| Selenium (Se)        | µg/g  | <0.20                        | 1.0              | 1.0                        | 1.0                         | 1.0                        |
| Silver (Ag)          | µg/g  | <0.10                        | 1.0              | 1.0                        | 1.3                         | 1.0                        |
| Sodium (Na)          | µg/g  | 68                           | 0.8              | 0.7                        | 1.0                         | 0.8                        |
| Strontium (Sr)       | µg/g  | 4.72                         | 0.8              | 0.8                        | 1.0                         | 0.7                        |
| Sulphur (S)          | µg/g  | <1,000                       | 1.0              | 1.0                        | 1.0                         | 1.0                        |
| Thallium (Tl)        | µg/g  | 0.068                        | 0.8              | 0.7                        | 1.3                         | 0.8                        |
| Tin (Sn)             | µg/g  | <2.0                         | 1.0              | 1.0                        | 1.0                         | 1.0                        |
| Titanium (Ti)        | µg/g  | 353                          | 0.7              | 0.8                        | 1.1                         | 0.7                        |
| Uranium (U)          | µg/g  | 0.922                        | 0.9              | 0.9                        | 1.2                         | 0.8                        |
| Vanadium (V)         | µg/g  | 19.5                         | 1.2              | 1.2                        | 1.3                         | 0.5                        |
| Zinc (Zn)            | µg/g  | 10.3                         | 0.8              | 1.0                        | 1.6                         | 0.9                        |
| Zirconium (Zr)       | µg/g  | 5.8                          | 0.8              | 0.7                        | 1.0                         | 0.5                        |



Denotes slight elevation (mean concentration 3 to 5 times higher than respective mean reference area value).  
Denotes moderate elevation (concentration 5 to 10 times higher than respective mean reference area value).  
Denotes highly elevated (mean concentration ≥10 times higher than respective mean reference area value).

**Table D.37: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River EO-01 Mine-Exposed Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Mary River Mine-Exposed Area Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|--------------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | EO-01-B1                             | EO-01-B3 | EO-01-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.11                                 | 0.12     | 0.10     | 0.11                          | 0.010              | 0.0058         |
| Aluminum (Al)        | µg/g  | -                    | 2,500                                | 1,930    | 2,790    | 2,407                         | 438                | 253            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.48                                 | 0.39     | 0.37     | 0.41                          | 0.059              | 0.034          |
| Barium (Ba)          | µg/g  | -                    | 12.1                                 | 9.12     | 12.7     | 11.3                          | 1.92               | 1.11           |
| Beryllium (Be)       | µg/g  | -                    | 0.12                                 | <0.10    | 0.11     | 0.11                          | 0.010              | 0.006          |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                | 0.33     | <0.20    | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                                 | <5.0     | <5.0     | <5.0                          | 0                  | 0              |
| Cadmium (Cd)         | µg/g  | 3.5                  | <0.020                               | 0.030    | 0.028    | <0.020                        | 0                  | 0              |
| Calcium (Ca)         | µg/g  | -                    | 2,250                                | 2,850    | 1,960    | 2,353                         | 454                | 262            |
| Chromium (Cr)        | µg/g  | 90                   | 31.1                                 | 11.0     | 14.1     | 18.7                          | 10.8               | 6.25           |
| Cobalt (Co)          | µg/g  | -                    | 3.49                                 | 1.81     | 2.43     | 2.58                          | 0.850              | 0.490          |
| Copper (Cu)          | µg/g  | 197                  | 3.88                                 | 3.97     | 4.29     | 4.05                          | 0.215              | 0.124          |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 33,000                               | 7,880    | 9,970    | 16,950                        | 13,939             | 8,048          |
| Lead (Pb)            | µg/g  | 91.3                 | 3.30                                 | 2.36     | 2.69     | 2.78                          | 0.477              | 0.275          |
| Lithium (Li)         | µg/g  | -                    | 3.6                                  | 2.8      | 3.9      | 3.4                           | 0.57               | 0.33           |
| Magnesium (Mg)       | µg/g  | -                    | 2,650                                | 2,370    | 2,870    | 2,630                         | 251                | 145            |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 113                                  | 62.9     | 80.2     | 85.4                          | 25.4               | 14.7           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                              | <0.0050  | <0.0050  | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.29                                 | 0.12     | 0.20     | 0.20                          | 0.085              | 0.049          |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 10.3                                 | 6.24     | 8.28     | 8.27                          | 2.03               | 1.17           |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 336                                  | 537      | 277      | 383                           | 136                | 79             |
| Potassium (K)        | µg/g  | -                    | 670                                  | 470      | 710      | 617                           | 129                | 74             |
| Selenium (Se)        | µg/g  | -                    | <0.20                                | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                                  | <50      | <50      | <50                           | 0                  | 0              |
| Strontium (Sr)       | µg/g  | -                    | 3.83                                 | 4.08     | 3.34     | 3.75                          | 0.376              | 0.217          |
| Sulphur (S)          | µg/g  | -                    | <1,000                               | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | <0.050                               | <0.050   | <0.050   | 0.050                         | 0                  | 0              |
| Tin (Sn)             | µg/g  | -                    | <2.0                                 | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 317                                  | 276      | 290      | 294                           | 21                 | 12             |
| Uranium (U)          | µg/g  | -                    | 0.999                                | 0.638    | 0.719    | 0.785                         | 0.189              | 0.109          |
| Vanadium (V)         | µg/g  | -                    | 43.8                                 | 10.9     | 13.3     | 22.7                          | 18.3               | 10.6           |
| Zinc (Zn)            | µg/g  | 315                  | 11.1                                 | 9.10     | 10.6     | 10.3                          | 1.04               | 0.601          |
| Zirconium (Zr)       | µg/g  | -                    | 4.1                                  | 3.2      | 4.0      | 3.8                           | 0.49               | 0.28           |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.38: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River EO-20 Mine-Exposed Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Mary River Mine-Exposed Area Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|--------------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | EO-20-B1                             | EO-20-B3 | EO-20-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>α</sup>      | 0.30                                 | <0.10    | 0.16     | 0.19                          | 0.10               | 0.059          |
| Aluminum (Al)        | µg/g  | -                    | 6,940                                | 2,170    | 3,540    | 4,217                         | 2,456              | 1,418          |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.75                                 | 0.58     | 0.52     | 0.62                          | 0.12               | 0.069          |
| Barium (Ba)          | µg/g  | -                    | 30.5                                 | 11.1     | 20.4     | 20.7                          | 9.70               | 5.60           |
| Beryllium (Be)       | µg/g  | -                    | 0.46                                 | 0.11     | 0.14     | 0.24                          | 0.19               | 0.11           |
| Bismuth (Bi)         | µg/g  | -                    | 0.51                                 | <0.20    | <0.20    | 0.30                          | 0.18               | 0.10           |
| Boron (B)            | µg/g  | -                    | 10.0                                 | <5.0     | <5.0     | 6.67                          | 2.89               | 1.67           |
| Cadmium (Cd)         | µg/g  | 3.5                  | 0.061                                | 0.030    | 0.023    | 0.038                         | 0.020              | 0.012          |
| Calcium (Ca)         | µg/g  | -                    | 4,210                                | 2,270    | 2,180    | 2,887                         | 1,147              | 662            |
| Chromium (Cr)        | µg/g  | 90                   | 27.6                                 | 30.5     | 20.1     | 26.1                          | 5.37               | 3.10           |
| Cobalt (Co)          | µg/g  | -                    | 5.26                                 | 3.04     | 3.33     | 3.88                          | 1.21               | 0.697          |
| Copper (Cu)          | µg/g  | 197                  | 9.65                                 | 7.44     | 5.11     | 7.40                          | 2.27               | 1.31           |
| Iron (Fe)            | µg/g  | 40,000 <sup>α</sup>  | 12,900                               | 25,700   | 19,100   | 19,233                        | 6,401              | 3,696          |
| Lead (Pb)            | µg/g  | 91.3                 | 5.89                                 | 2.98     | 3.94     | 4.27                          | 1.48               | 0.856          |
| Lithium (Li)         | µg/g  | -                    | 11.4                                 | 3.10     | 4.50     | 6.33                          | 4.44               | 2.57           |
| Magnesium (Mg)       | µg/g  | -                    | 7,380                                | 2,170    | 3,770    | 4,440                         | 2,669              | 1,541          |
| Manganese (Mn)       | µg/g  | 1,100 <sup>α,β</sup> | 180                                  | 105      | 125      | 137                           | 39                 | 22             |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                              | <0.0050  | <0.0050  | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.54                                 | 0.15     | 0.39     | 0.36                          | 0.20               | 0.11           |
| Nickel (Ni)          | µg/g  | 75 <sup>α,β</sup>    | 23.9                                 | 12.2     | 14.0     | 16.7                          | 6.30               | 3.64           |
| Phosphorus (P)       | µg/g  | 2,000 <sup>α</sup>   | 376                                  | 452      | 300      | 376                           | 76                 | 44             |
| Potassium (K)        | µg/g  | -                    | 1,820                                | 520      | 1,160    | 1,167                         | 650                | 375            |
| Selenium (Se)        | µg/g  | -                    | <0.20                                | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | 0.18                                 | <0.10    | <0.10    | 0.13                          | 0.046              | 0.027          |
| Sodium (Na)          | µg/g  | -                    | 100                                  | <50      | <50      | 67                            | 29                 | 17             |
| Strontium (Sr)       | µg/g  | -                    | 6.54                                 | 4.31     | 3.22     | 4.69                          | 1.69               | 0.98           |
| Sulphur (S)          | µg/g  | -                    | <1,000                               | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.140                                | <0.050   | 0.068    | 0.086                         | 0.048              | 0.027          |
| Tin (Sn)             | µg/g  | -                    | <2.0                                 | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 549                                  | 309      | 330      | 396                           | 133                | 77             |
| Uranium (U)          | µg/g  | -                    | 1.45                                 | 0.805    | 1.02     | 1.09                          | 0.328              | 0.190          |
| Vanadium (V)         | µg/g  | -                    | 18.7                                 | 37.1     | 21.9     | 25.9                          | 9.83               | 5.68           |
| Zinc (Zn)            | µg/g  | 315                  | 25.4                                 | 9.70     | 15.9     | 17.0                          | 7.91               | 4.57           |
| Zirconium (Zr)       | µg/g  | -                    | 9.2                                  | 4.9      | 3.1      | 5.7                           | 3.1                | 1.8            |

 Indicates parameter concentration above SQG.

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except <sup>α</sup> = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and <sup>β</sup> = British Columbia Working SQG PEL (BC ENV 2020).



**Table D.39: Deposited Sediment Total Organic Carbon and Metal Concentrations at Mary River Downstream (CO-05) Stations, Mary River Project CREMP, August 2020**

| Analyte              | Units | SQG <sup>a</sup>     | Mary River Downstream Mine-Exposed Area Station |          |          | Study Area Summary Statistics |                    |                |
|----------------------|-------|----------------------|-------------------------------------------------|----------|----------|-------------------------------|--------------------|----------------|
|                      |       |                      | CO-05-B1                                        | CO-05-B3 | CO-05-B5 | Mean                          | Standard Deviation | Standard Error |
| Total Organic Carbon | %     | 10 <sup>a</sup>      | 0.12                                            | <0.10    | 0.13     | <0.10                         | 0                  | 0              |
| Aluminum (Al)        | µg/g  | -                    | 2,810                                           | 964      | 3,630    | 2,468                         | 1,366              | 788            |
| Antimony (Sb)        | µg/g  | -                    | <0.10                                           | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Arsenic (As)         | µg/g  | 17                   | 0.33                                            | 0.12     | 0.66     | 0.37                          | 0.27               | 0.16           |
| Barium (Ba)          | µg/g  | -                    | 12.9                                            | 3.90     | 13.9     | 10.2                          | 5.51               | 3.18           |
| Beryllium (Be)       | µg/g  | -                    | 0.11                                            | <0.10    | 0.18     | 0.13                          | 0.044              | 0.025          |
| Bismuth (Bi)         | µg/g  | -                    | <0.20                                           | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Boron (B)            | µg/g  | -                    | <5.0                                            | <5.0     | <5.0     | <5.0                          | 0                  | 0              |
| Cadmium (Cd)         | µg/g  | 3.5                  | <0.020                                          | <0.020   | <0.020   | <0.020                        | 0                  | 0              |
| Calcium (Ca)         | µg/g  | -                    | 2,340                                           | 539      | 3,260    | 2,046                         | 1,384              | 799            |
| Chromium (Cr)        | µg/g  | 90                   | 12.0                                            | 4.41     | 25.9     | 14.1                          | 10.9               | 6.29           |
| Cobalt (Co)          | µg/g  | -                    | 2.44                                            | 0.81     | 3.70     | 2.32                          | 1.45               | 0.84           |
| Copper (Cu)          | µg/g  | 197                  | 3.27                                            | 1.24     | 4.91     | 3.14                          | 1.84               | 1.06           |
| Iron (Fe)            | µg/g  | 40,000 <sup>a</sup>  | 7,270                                           | 1,960    | 10,100   | 6,443                         | 4,132              | 2,386          |
| Lead (Pb)            | µg/g  | 91.3                 | 2.45                                            | 1.23     | 3.21     | 2.30                          | 1.00               | 0.577          |
| Lithium (Li)         | µg/g  | -                    | 4.7                                             | <2.0     | 7.7      | 4.80                          | 2.85               | 1.65           |
| Magnesium (Mg)       | µg/g  | -                    | 3,380                                           | 1,010    | 5,750    | 3,380                         | 2,370              | 1,368          |
| Manganese (Mn)       | µg/g  | 1,100 <sup>a,β</sup> | 83.5                                            | 27.1     | 107      | 72.5                          | 41.1               | 23.7           |
| Mercury (Hg)         | µg/g  | 0.486                | <0.0050                                         | <0.0050  | <0.0050  | <0.0050                       | 0                  | 0              |
| Molybdenum (Mo)      | µg/g  | -                    | 0.12                                            | <0.10    | 0.15     | <0.10                         | 0                  | 0              |
| Nickel (Ni)          | µg/g  | 75 <sup>a,β</sup>    | 9.68                                            | 4.22     | 28.7     | 14.2                          | 12.9               | 7.42           |
| Phosphorus (P)       | µg/g  | 2,000 <sup>a</sup>   | 271                                             | 103      | 436      | 270                           | 167                | 96             |
| Potassium (K)        | µg/g  | -                    | 630                                             | 180      | 740      | 517                           | 297                | 171            |
| Selenium (Se)        | µg/g  | -                    | <0.20                                           | <0.20    | <0.20    | <0.20                         | 0                  | 0              |
| Silver (Ag)          | µg/g  | -                    | <0.10                                           | <0.10    | <0.10    | <0.10                         | 0                  | 0              |
| Sodium (Na)          | µg/g  | -                    | <50                                             | <50      | 71       | <50                           | 12                 | 7              |
| Strontium (Sr)       | µg/g  | -                    | 3.36                                            | 1.94     | 4.54     | 3.28                          | 1.30               | 0.752          |
| Sulphur (S)          | µg/g  | -                    | <1,000                                          | <1,000   | <1,000   | <1,000                        | 0                  | 0              |
| Thallium (Tl)        | µg/g  | -                    | 0.054                                           | <0.050   | 0.062    | 0.055                         | 0.0061             | 0.0035         |
| Tin (Sn)             | µg/g  | -                    | <2.0                                            | <2.0     | <2.0     | <2.0                          | 0                  | 0              |
| Titanium (Ti)        | µg/g  | -                    | 321                                             | 93.2     | 350      | 255                           | 141                | 81.2           |
| Uranium (U)          | µg/g  | -                    | 0.577                                           | 0.227    | 1.37     | 0.725                         | 0.586              | 0.338          |
| Vanadium (V)         | µg/g  | -                    | 10.5                                            | 3.19     | 14.1     | 9.26                          | 5.56               | 3.21           |
| Zinc (Zn)            | µg/g  | 315                  | 10.1                                            | 3.30     | 14.1     | 9.17                          | 5.46               | 3.15           |
| Zirconium (Zr)       | µg/g  | -                    | 3.2                                             | 1.5      | 4.5      | 3.1                           | 1.5                | 0.87           |

 Indicates parameter concentration above SQG).

Notes: SQG = Sediment Quality Guidelines. "-" = no applicable SQG.

<sup>a</sup> Canadian SQG for the protection of aquatic life probable effects level (PEL; CCME 2020) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BC ENV 2020).

**Table D.40: Field Observations of Sediment Properties at Mary Lake (BLO) Benthic Stations<sup>a</sup>, Mary River Project CREMP, August 2020**

| Station | Station Depth (m) | Colour and Texture Observations                             | Evidence of Anoxia <sup>b</sup> | Plant or Algal Presence |
|---------|-------------------|-------------------------------------------------------------|---------------------------------|-------------------------|
| BLO-01  | 10.0              | brown silt on top of grey silt, some sand intermixed        | none detected                   | none observed           |
| BLO-11  | 9.3               | grey-brown silt with sand intermixed                        | none detected                   | none observed           |
| BLO-7   | 12.8              | brown silt                                                  | none detected                   | none observed           |
| BLO-6   | 6.7               | brown silt                                                  | none detected                   | none observed           |
| BLO-3   | 16.4              | red-brown oxidized surface layer over grey-brown silty-sand | none detected                   | none observed           |
| BLO-15  | 29.1              | red-brown oxidized surface layer over grey-brown silt       | none detected                   | none observed           |
| BLO-14  | 20.0              | brown silt, some sand intermixed                            | none detected                   | none observed           |
| BLO-13  | 22.0              | brown silt                                                  | none detected                   | none observed           |
| BLO-4   | 22.0              | brown silt                                                  | none detected                   | none observed           |
| BLO-5   | 21.5              | brown silt                                                  | none detected                   | none observed           |

<sup>a</sup> Sediment particle size and benthic invertebrate community samples were collected using a petite-Ponar.

<sup>b</sup> Evidence of anoxic sediments assessed visually as the presence of blackened substrate, and by smell based on presence/strength of hydrogen sulphide odour.

**Table D.41: Observations from Sediment Cores Collected at Mary Lake (BLO), Mary River Project CREMP, August 2020**

| Sample Station | Station Depth (m) | Station Type | Core Number | Core Length (cm) | Surficial Substrate Texture Description                                                                                   |
|----------------|-------------------|--------------|-------------|------------------|---------------------------------------------------------------------------------------------------------------------------|
| BLO-01         | 10.0              | Littoral     | 1           | 7.0              | brown silt floc overlying grey silt intermixed with sand; black streaking in upper layer                                  |
|                |                   |              | 2           | 12.0             |                                                                                                                           |
|                |                   |              | 3           | 9.5              |                                                                                                                           |
|                |                   |              | 4           | 11.5             |                                                                                                                           |
| BLO-16         | 30.5              | Profundal    | 1           | 31.0             | reddish oxidized silt overlying medium brown silt that becomes more consolidated with depth; no black streaking           |
|                |                   |              | 2           | 36.0             |                                                                                                                           |
|                |                   |              | 3           | 25.0             |                                                                                                                           |
|                |                   |              | 4           | 33.0             |                                                                                                                           |
| BLO-03         | 16.0              | Profundal    | 1           | 16.0             | reddish brown silty sand overlying medium brown sandy silt; possible redox boundary between layers but no black streaking |
|                |                   |              | 2           | 19.0             |                                                                                                                           |
|                |                   |              | 3           | 21.0             |                                                                                                                           |
|                |                   |              | 4           | 20.5             |                                                                                                                           |
| BLO-14         | 20.0              | Profundal    | 1           | 26.0             | reddish brown silt overlying medium brown silt with fine sand intermixed; black streaking present                         |
|                |                   |              | 2           | 22.0             |                                                                                                                           |
|                |                   |              | 3           | 23.0             |                                                                                                                           |
|                |                   |              | 4           | 19.0             |                                                                                                                           |
| BLO-12         | 20.0              | Profundal    | 1           | 14.0             | reddish brown silt overlying medium brown silt, possibly reduced between layers; some black streaking present             |
|                |                   |              | 2           | 10.0             |                                                                                                                           |
|                |                   |              | 3           | 22.0             |                                                                                                                           |
|                |                   |              | 4           | 11.5             |                                                                                                                           |
| BLO-04         | 19.5              | Profundal    | 1           | 15.0             | reddish brown silt overlying grey-brown silt that becomes more consolidated with depth; some black streaking present      |
|                |                   |              | 2           | 23.5             |                                                                                                                           |
|                |                   |              | 3           | 18.5             |                                                                                                                           |
|                |                   |              | 4           | 7.0              |                                                                                                                           |
| BLO-10         | 19.0              | Profundal    | 1           | 11.0             | light brown silt floc overlying grey-brown silt                                                                           |
|                |                   |              | 2           | 11.0             |                                                                                                                           |
|                |                   |              | 3           | 12.0             |                                                                                                                           |
|                |                   |              | 4           | 11.5             |                                                                                                                           |
| BLO-09         | 29.0              | Profundal    | 1           | 11.0             | red-brown silt floc overlying grey-brown silt; black streaking in upper layer                                             |
|                |                   |              | 2           | 6.5              |                                                                                                                           |
|                |                   |              | 3           | 10.0             |                                                                                                                           |
|                |                   |              | 4           | 16.5             |                                                                                                                           |
| BLO-08         | 26.0              | Profundal    | 1           | 10.5             | light brown silt floc overlying consolidated grey-brown silt.                                                             |
|                |                   |              | 2           | 12.5             |                                                                                                                           |
|                |                   |              | 3           | 11.5             |                                                                                                                           |
|                |                   |              | 4           | 9.0              |                                                                                                                           |
| BLO-06         | 6.0               | Littoral     | 1           | 10.0             | light brown silt                                                                                                          |
|                |                   |              | 2           | 9.5              |                                                                                                                           |
|                |                   |              | 3           | 7.5              |                                                                                                                           |
|                |                   |              | 4           | 10.5             |                                                                                                                           |

**Table D.42: Sediment Particle Size, Total Organic Carbon, and Metal Concentrations at Mary Lake (BLO) Sediment Stations, Mary River Project CREMP, August 2020**

| Analyte    |                      | Units | Sediment Quality Guideline (SQG) <sup>a</sup> | AEMP Benchmark <sup>b</sup> | Mary Lake Stations |                    |                    |                    |                    |                    |                    |                    |                    |                   | Summary Statistics |                    |                |
|------------|----------------------|-------|-----------------------------------------------|-----------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|--------------------|----------------|
|            |                      |       |                                               |                             | BLO-01 (littoral)  | BLO-16 (profundal) | BLO-03 (profundal) | BLO-14 (profundal) | BLO-12 (profundal) | BLO-04 (profundal) | BLO-10 (profundal) | BLO-09 (profundal) | BLO-08 (profundal) | BLO-06 (littoral) | Mean               | Standard Deviation | Standard Error |
| Non-metals | Sand                 | %     | -                                             | -                           | 21.6               | 22.2               | 91.9               | 21.2               | 24.3               | 23.6               | 4.5                | 5.6                | 2.3                | 6.8               | 22.4               | 26.0               | 8.22           |
|            | Silt                 | %     | -                                             | -                           | 69.9               | 46.7               | 6.0                | 45.5               | 61.7               | 55.5               | 62.7               | 65.1               | 64.8               | 63.8              | 54.2               | 18.7               | 5.92           |
|            | Clay                 | %     | -                                             | -                           | 8.5                | 31.1               | 2.1                | 33.2               | 14.0               | 20.9               | 32.8               | 29.4               | 32.9               | 29.4              | 23.4               | 11.43              | 3.62           |
|            | Moisture             | %     | -                                             | -                           | 40.9               | 57.5               | 16.6               | 66.8               | 37.8               | 51.3               | 43.5               | 51.1               | 53.5               | 67.3              | 48.6               | 15.0               | 4.74           |
|            | Total Organic Carbon | %     | 10 <sup>α</sup>                               | -                           | 1.31               | 1.49               | 0.22               | 0.93               | 0.68               | 0.54               | 0.46               | 0.38               | 0.65               | 0.68              | 0.73               | 0.40               | 0.13           |
| Metals     | Aluminum (Al)        | mg/kg | -                                             | -                           | 15,000             | 24,200             | 9,230              | 30,100             | 20,700             | 20,600             | 25,500             | 22,600             | 28,000             | 29,600            | 22,553             | 6,578              | 2,080          |
|            | Antimony (Sb)        | mg/kg | -                                             | -                           | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10              | <0.10             | <0.10              | 0                  | 0              |
|            | Arsenic (As)         | mg/kg | 17                                            | 5.9                         | 4.82               | 4.01               | 1.47               | 4.04               | 2.33               | 2.63               | 3.18               | 3.67               | 3.42               | 3.47              | 3.30               | 0.960              | 0.304          |
|            | Barium (Ba)          | mg/kg | -                                             | -                           | 79.2               | 99.9               | 36.7               | 110                | 74.8               | 74.5               | 96.4               | 102                | 96.3               | 104               | 87.4               | 21.8               | 6.90           |
|            | Beryllium (Be)       | mg/kg | -                                             | -                           | 0.72               | 1.17               | 0.42               | 1.38               | 0.91               | 0.86               | 1.14               | 1.03               | 1.25               | 1.33              | 1.02               | 0.299              | 0.0945         |
|            | Bismuth (Bi)         | mg/kg | -                                             | -                           | <0.20              | 0.25               | <0.20              | 0.25               | 0.26               | 0.21               | 0.23               | 0.23               | 0.26               | 0.23              | 0.23               | 0.023              | 0.0073         |
|            | Boron (B)            | mg/kg | -                                             | -                           | 18.9               | 31.8               | 15.5               | 45.2               | 24.2               | 25.7               | 31.0               | 25.6               | 42.0               | 43.9              | 30.4               | 10.4               | 3.29           |
|            | Cadmium (Cd)         | mg/kg | 3.5                                           | 1.5                         | 0.108              | 0.156              | 0.066              | 0.186              | 0.128              | 0.109              | 0.151              | 0.144              | 0.162              | 0.145             | 0.136              | 0.0340             | 0.0108         |
|            | Calcium (Ca)         | mg/kg | -                                             | -                           | 7,720              | 3,950              | 1,890              | 4,810              | 4,460              | 4,350              | 4,710              | 4,490              | 5,040              | 5,310             | 4,673              | 1,426              | 451            |
|            | Chromium (Cr)        | mg/kg | 90                                            | 98                          | 60.6               | 83.4               | 31.1               | 93.0               | 75.5               | 82.1               | 86.3               | 87.8               | 97.7               | 94.1              | 79.2               | 19.9               | 6.31           |
|            | Cobalt (Co)          | mg/kg | -                                             | -                           | 14.0               | 16.1               | 6.93               | 19.9               | 14.8               | 14.7               | 17.4               | 17.7               | 18.7               | 18.7              | 15.9               | 3.71               | 1.17           |
|            | Copper (Cu)          | mg/kg | 110                                           | 50                          | 27.8               | 37.4               | 11.8               | 39.2               | 28.2               | 28.7               | 35.0               | 32.7               | 37.0               | 36.0              | 31.4               | 8.02               | 2.54           |
|            | Iron (Fe)            | mg/kg | 40,000 <sup>α</sup>                           | 52,400                      | 34,500             | 41,000             | 18,800             | 47,000             | 40,000             | 35,200             | 42,300             | 43,400             | 44,400             | 46,600            | 39,320             | 8,352              | 2,641          |
|            | Lead (Pb)            | mg/kg | 91.3                                          | 35                          | 14.5               | 23.8               | 8.25               | 26.5               | 17.1               | 18.7               | 24.6               | 21.6               | 24.2               | 25.5              | 20.5               | 5.82               | 1.84           |
|            | Lithium (Li)         | mg/kg | -                                             | -                           | 29.2               | 45.8               | 15.8               | 51.5               | 33.6               | 35.5               | 46.8               | 39.8               | 47.0               | 50.7              | 39.6               | 11.2               | 3.55           |
|            | Magnesium (Mg)       | mg/kg | -                                             | -                           | 14,500             | 16,500             | 5,870              | 18,800             | 15,400             | 14,900             | 17,200             | 16,200             | 18,500             | 18,700            | 15,657             | 3,777              | 1,194          |
|            | Manganese (Mn)       | mg/kg | 1,100 <sup>α,β</sup>                          | 4,370                       | 1,350              | 407                | 1,490              | 955                | 835                | 617                | 2,490              | 4,980              | 1,770              | 778               | 1,567              | 1,349              | 427            |
|            | Mercury (Hg)         | mg/kg | 0.486                                         | 0.17                        | 0.0293             | 0.0823             | 0.0264             | 0.0814             | 0.0344             | 0.0393             | 0.0539             | 0.0430             | 0.0612             | 0.0541            | 0.0505             | 0.0199             | 0.00630        |
|            | Molybdenum (Mo)      | mg/kg | -                                             | -                           | 0.52               | 0.70               | 0.51               | 0.80               | 1.31               | 0.73               | 1.37               | 1.29               | 1.12               | 0.92              | 0.927              | 0.326              | 0.103          |
|            | Nickel (Ni)          | mg/kg | 75 <sup>α,β</sup>                             | 72                          | 51.7               | 63.4               | 23.8               | 66.3               | 54.8               | 58.8               | 60.0               | 66.4               | 69.0               | 62.0              | 57.6               | 13.03              | 4.12           |
|            | Phosphorus (P)       | mg/kg | 2,000 <sup>α</sup>                            | 1,580                       | 1,100              | 1,050              | 449                | 917                | 876                | 857                | 791                | 1,020              | 876                | 849               | 879                | 181                | 57             |
|            | Potassium (K)        | mg/kg | -                                             | -                           | 3,470              | 6,180              | 2,150              | 7,780              | 5,020              | 5,120              | 6,410              | 5,590              | 7,230              | 7,650             | 5,660              | 1,813              | 573            |
|            | Selenium (Se)        | mg/kg | -                                             | -                           | <0.20              | 0.26               | <0.20              | 0.34               | <0.20              | <0.20              | 0.21               | 0.23               | 0.24               | 0.26              | 0.23               | 0.045              | 0.014          |
|            | Silver (Ag)          | mg/kg | -                                             | -                           | <0.10              | 0.17               | <0.10              | 0.17               | 0.14               | 0.14               | 0.16               | 0.15               | 0.17               | 0.16              | 0.15               | 0.027              | 0.008          |
|            | Sodium (Na)          | mg/kg | -                                             | -                           | 238                | 393                | 147                | 434                | 290                | 335                | 405                | 383                | 448                | 453               | 353                | 100                | 32             |
|            | Strontium (Sr)       | mg/kg | -                                             | -                           | 11.1               | 16.5               | 6.70               | 17.1               | 11.2               | 12.4               | 14.3               | 13.4               | 16.4               | 16.7              | 13.6               | 3.33               | 1.052          |
|            | Sulphur (S)          | mg/kg | -                                             | -                           | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | <1,000             | <1,000            | <1,000             | 0                  | 0              |
|            | Thallium (Tl)        | mg/kg | -                                             | -                           | 0.298              | 0.484              | 0.194              | 0.609              | 0.392              | 0.417              | 0.571              | 0.484              | 0.539              | 0.603             | 0.459              | 0.136              | 0.0429         |
|            | Tin (Sn)             | mg/kg | -                                             | -                           | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0               | <2.0              | <2.0               | 0                  | 0              |
|            | Titanium (Ti)        | mg/kg | -                                             | -                           | 978                | 1,340              | 608                | 1,760              | 1,470              | 1,470              | 1,710              | 1,500              | 1,870              | 1,970             | 1,468              | 416                | 131            |
|            | Uranium (U)          | mg/kg | -                                             | -                           | 3.35               | 7.96               | 3.43               | 9.89               | 6.22               | 6.29               | 8.49               | 6.55               | 8.19               | 8.48              | 6.89               | 2.17               | 0.686          |
|            | Vanadium (V)         | mg/kg | -                                             | -                           | 48.0               | 68.0               | 26.0               | 80.0               | 55.0               | 57.1               | 69.6               | 63.5               | 74.4               | 78.6              | 62.0               | 16.4               | 5.18           |
|            | Zinc (Zn)            | mg/kg | 315                                           | 135                         | 48.1               | 73.1               | 27.6               | 85.4               | 63.8               | 62.0               | 78.6               | 69.1               | 79.9               | 86.2              | 67.4               | 18.2               | 5.77           |
|            | Zirconium (Zr)       | mg/kg | -                                             | -                           | 10.4               | 23.5               | 6.4                | 23.0               | 16.9               | 22.1               | 25.1               | 20.4               | 25.5               | 25.9              | 19.9               | 6.70               | 2.12           |

Indicates parameter concentration above Sediment Quality Guideline (SQG).

**BOLD**

 Indicates parameter concentration above the AEMP Benchmark.

Note: "-" indicates no SQG applicable.

<sup>a</sup> Canadian Sediment Quality Guideline for the protection of aquatic life probable effects level (PEL; CCME 2015) except α (Ontario Provincial Sediment Quality Guideline [PSQG] severe effect level [SEL]; OMOE 1993) and β (British Columbia Working Sediment Quality Guideline [BCSQG] probable effects level [PEL; BCMOE 2015]).

<sup>b</sup> AEMP Sediment Quality Benchmarks developed by Intrinsic (2013) using sediment quality guidelines, background sediment quality data, and method detection limits. The indicated values are specific to Mary Lake.

**Table D.43: Statistical Comparison of Sediment Physical Properties Between Mary Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results          |                |                                       |         | Summary Statistics |                   |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|-------------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Study Lake         | Sample Size ( n ) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                            | log10          | NO                                    | 0.310   | Reference          | 5                 | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                                   |                |                                       |         | Mary               | 4                 | 28.1 | 34.5               | 17.2           | 5.2     | 78.6    |
|                             | Silt-Sized Material (%)                | tequal                            | none           | NO                                    | 0.459   | Reference          | 5                 | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                                   |                |                                       |         | Mary               | 4                 | 53.6 | 24.0               | 12.0           | 18.0    | 69.9    |
|                             | Clay-Sized Material (%)                | tunequal                          | none           | NO                                    | 0.258   | Reference          | 5                 | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                                   |                |                                       |         | Mary               | 4                 | 18.3 | 14.5               | 7.2            | 3.4     | 32.0    |
|                             | Moisture (%)                           | tunequal                          | none           | YES                                   | 0.031   | Reference          | 5                 | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                                   |                |                                       |         | Mary               | 4                 | 50.7 | 19.9               | 10.0           | 27.3    | 67.3    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                            | none           | YES                                   | 0.005   | Reference          | 5                 | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                                   |                |                                       |         | Mary               | 4                 | 0.8  | 0.5                | 0.2            | 0.2     | 1.3     |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | tequal                            | log10          | NO                                    | 0.239   | Reference          | 5                 | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                                   |                |                                       |         | Mary               | 11                | 21.6 | 24.7               | 7.4            | 2.3     | 91.9    |
|                             | Silt-Sized Material (%)                | M-W                               | rank           | NO                                    | 0.743   | Reference          | 5                 | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                                   |                |                                       |         | Mary               | 11                | 54.9 | 18.6               | 5.6            | 6.0     | 73.4    |
|                             | Clay-Sized Material (%)                | tequal                            | none           | YES                                   | 0.025   | Reference          | 5                 | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                                   |                |                                       |         | Mary               | 11                | 23.5 | 10.6               | 3.2            | 2.1     | 33.2    |
|                             | Moisture (%)                           | tequal                            | none           | YES                                   | 0.001   | Reference          | 5                 | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                                   |                |                                       |         | Mary               | 11                | 49.2 | 14.3               | 4.3            | 16.6    | 68.4    |
|                             | Total Organic Carbon (TOC) Content (%) | tunequal                          | none           | YES                                   | 0.004   | Reference          | 5                 | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                                   |                |                                       |         | Mary               | 11                | 0.7  | 0.3                | 0.1            | 0.2     | 1.5     |

 Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table D.44: Magnitude of Elevation in Sediment Metal Concentrations between Mary Lake and Reference Lake 3 2020 Data, and between Mary Lake 2020 and Baseline Data, Mary River Project CREMP, 2020**

| Parameter       | Mary Lake versus Reference Lake 3 in 2020 |                        |                                     |                        | Mary Lake 2020 versus Baseline Period    |                        |                                          |                        |
|-----------------|-------------------------------------------|------------------------|-------------------------------------|------------------------|------------------------------------------|------------------------|------------------------------------------|------------------------|
|                 | Littoral Stations                         |                        | Profundal Stations                  |                        | Littoral Stations                        |                        | Profundal Stations                       |                        |
|                 | Reference Lake Concentration (µg/g)       | Magnitude of Elevation | Reference Lake Concentration (µg/g) | Magnitude of Elevation | Mary Lake Baseline Concentration (mg/kg) | Magnitude of Elevation | Mary Lake Baseline Concentration (mg/kg) | Magnitude of Elevation |
| Aluminum (Al)   | 16,880                                    | 1.3                    | 21,800                              | 1.0                    | 18,267                                   | 1.2                    | 17,000                                   | 1.3                    |
| Antimony (Sb)   | <0.10                                     | 1.0                    | <0.10                               | 1.0                    | 1.0                                      | 0.1                    | 1.0                                      | 0.1                    |
| Arsenic (As)    | 3.53                                      | 1.2                    | 4.07                                | 0.8                    | 2.80                                     | 1.5                    | 3.70                                     | 0.8                    |
| Barium (Ba)     | 117                                       | 0.8                    | 122                                 | 0.7                    | 105                                      | 0.9                    | 75.9                                     | 1.1                    |
| Beryllium (Be)  | 0.65                                      | 1.6                    | 0.80                                | 1.3                    | 1.0                                      | 1.0                    | 1.0                                      | 1.0                    |
| Bismuth (Bi)    | <0.20                                     | 1.1                    | <0.20                               | 1.2                    | -                                        | -                      | -                                        | -                      |
| Boron (B)       | 12.2                                      | 2.6                    | 14.7                                | 2.1                    | 0.733                                    | 42.8                   | 2.09                                     | 14.4                   |
| Cadmium (Cd)    | 0.173                                     | 0.7                    | 0.148                               | 0.9                    | 0.500                                    | 0.3                    | 0.500                                    | 0.3                    |
| Calcium (Ca)    | 5,608                                     | 1.2                    | 5,010                               | 0.8                    | 3,130                                    | 2.1                    | 2,934                                    | 1.4                    |
| Chromium (Cr)   | 54.3                                      | 1.4                    | 65.0                                | 1.2                    | 81.0                                     | 1.0                    | 76.3                                     | 1.0                    |
| Cobalt (Co)     | 10.8                                      | 1.5                    | 15.2                                | 1.0                    | 18.3                                     | 0.9                    | 17.8                                     | 0.9                    |
| Copper (Cu)     | 71.4                                      | 0.4                    | 83.8                                | 0.4                    | 45.0                                     | 0.7                    | 43.9                                     | 0.7                    |
| Iron (Fe)       | 50,600                                    | 0.8                    | 45,080                              | 0.9                    | 36,133                                   | 1.1                    | 35,654                                   | 1.1                    |
| Lead (Pb)       | 13.8                                      | 1.5                    | 16.7                                | 1.2                    | 18.0                                     | 1.1                    | 21.3                                     | 1.0                    |
| Lithium (Li)    | 26.0                                      | 1.5                    | 33.7                                | 1.2                    | -                                        | -                      | -                                        | -                      |
| Magnesium (Mg)  | 11,440                                    | 1.5                    | 14,180                              | 1.1                    | 13,967                                   | 1.2                    | 10,903                                   | 1.4                    |
| Manganese (Mn)  | 579                                       | 1.8                    | 1,230                               | 1.4                    | 699                                      | 1.5                    | 991                                      | 1.7                    |
| Mercury (Hg)    | 0.0500                                    | 0.8                    | 0.0583                              | 0.9                    | 0.100                                    | 0.4                    | 0.100                                    | 0.5                    |
| Molybdenum (Mo) | 4.44                                      | 0.2                    | 2.52                                | 0.4                    | 1.0                                      | 0.7                    | 1.0                                      | 1.0                    |
| Nickel (Ni)     | 40.0                                      | 1.4                    | 45.0                                | 1.3                    | 67.0                                     | 0.8                    | 65.4                                     | 0.9                    |
| Phosphorus (P)  | 1,167                                     | 0.8                    | 956                                 | 0.9                    | 800                                      | 1.2                    | 1,325                                    | 0.6                    |
| Potassium (K)   | 4,100                                     | 1.4                    | 5,338                               | 1.1                    | 3,450                                    | 1.6                    | 4,287                                    | 1.3                    |
| Selenium (Se)   | 0.728                                     | 0.3                    | 0.614                               | 0.4                    | 1.0                                      | 0.2                    | 1.0                                      | 0.2                    |
| Silver (Ag)     | 0.142                                     | 0.9                    | 0.202                               | 0.7                    | 0.273                                    | 0.5                    | 0.365                                    | 0.4                    |
| Sodium (Na)     | 304                                       | 1.1                    | 369                                 | 1.0                    | 279                                      | 1.2                    | 284                                      | 1.2                    |
| Strontium (Sr)  | 11.6                                      | 1.2                    | 12.3                                | 1.1                    | 9.3                                      | 1.5                    | 13.3                                     | 1.0                    |
| Sulphur (S)     | 1,400                                     | 0.7                    | 1,140                               | 0.9                    | -                                        | -                      | -                                        | -                      |
| Thallium (Tl)   | 0.379                                     | 1.2                    | 0.594                               | 0.8                    | 1.0                                      | 0.5                    | 1.0                                      | 0.5                    |
| Tin (Sn)        | <2.0                                      | 1.0                    | <2.0                                | 1.0                    | -                                        | -                      | -                                        | -                      |
| Titanium (Ti)   | 1,006                                     | 1.5                    | 1,136                               | 1.3                    | -                                        | -                      | -                                        | -                      |
| Uranium (U)     | 11.0                                      | 0.5                    | 19.7                                | 0.4                    | -                                        | -                      | -                                        | -                      |
| Vanadium (V)    | 54.1                                      | 1.2                    | 63.4                                | 1.0                    | 69.0                                     | 0.9                    | 63.3                                     | 1.0                    |
| Zinc (Zn)       | 73.1                                      | 0.9                    | 83.8                                | 0.8                    | 67.0                                     | 1.0                    | 63.6                                     | 1.1                    |
| Zirconium (Zr)  | 4.5                                       | 4.0                    | 3.9                                 | 5.2                    | -                                        | -                      | -                                        | -                      |



Denotes slight elevation (concentration 3 to 5 times higher than respective mean reference lake value or baseline period, as applicable).  
Denotes moderate elevation (concentration 5 to 10 times higher than mean reference area value or baseline period value, as applicable).  
Denotes high elevation (concentration is ≥ 10 times higher than mean reference area value or baseline period value, as applicable).

Note: '-' indicates baseline data not available.



**Mary River Project 2020  
Core Receiving Environment Monitoring  
Program Report**

**Part 3 of 3  
(Appendices E to G)**

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**APPENDIX E**  
**PHYTOPLANKTON DATA**



**Table E.1:** Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Lotic Reference Stations, Camp Lake Tributaries, Sheardown Lake Tributary 1, and Tom River, Mary River Project 2020 CREMP

| Station                |                    | Reference Creek Stations |           |           |           | Camp Lake Tributary 1 (CLT1) |           |           |           |           |           | Camp Lake Tributary 2 | Camp Lake Outlet | Sheardown Lake Tributary 1 (SDLT1) |           | Tom River |
|------------------------|--------------------|--------------------------|-----------|-----------|-----------|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------------------|------------------|------------------------------------|-----------|-----------|
|                        |                    |                          |           |           |           | North Branch                 |           | Main Stem |           |           |           |                       |                  | D1-05                              | D1-00     |           |
|                        |                    | CLT-REF4                 | CLT-REF3  | MRY-REF3  | MRY-REF2  | L1-08                        | L1-02     | L2-03     | L1-09     | L1-05     | L0-01     | K0-01                 | J0-01            |                                    |           | D1-05     |
| Sample Collection Date | Spring             | 4-Jul-20                 | 4-Jul-20  | 4-Jul-20  | 4-Jul-20  | 4-Jul-20                     | 2-Jul-20  | 2-Jul-20  | 2-Jul-20  | 3-Jul-20  | 3-Jul-20  | 3-Jul-20              | 4-Jul-20         | 2-Jul-20                           | 2-Jul-20  | 4-Jul-20  |
|                        | Summer             | 3-Aug-20                 | 3-Aug-20  | 3-Aug-20  | 3-Aug-20  | 3-Aug-20                     | 2-Aug-20  | 2-Aug-20  | 2-Aug-20  | 2-Aug-20  | 2-Aug-20  | 2-Aug-20              | 3-Aug-20         | 3-Aug-20                           | 3-Aug-20  | 3-Aug-20  |
|                        | Fall               | 29-Aug-20                | 29-Aug-20 | 29-Aug-20 | 29-Aug-20 | 28-Aug-20                    | 30-Aug-20 | 29-Aug-20 | 30-Aug-20 | 30-Aug-20 | 29-Aug-20 | 29-Aug-20             | 29-Aug-20        | 29-Aug-20                          | 29-Aug-20 | 29-Aug-20 |
| Chlorophyll-a (µg/L)   | Spring             | 0.35                     | 0.31      | 0.24      | 0.34      | 0.21                         | 0.27      | 0.66      | 0.35      | 0.36      | 0.32      | <0.10                 | 0.79             | 0.22                               | 0.24      | 0.24      |
|                        | Summer             | 0.62                     | 0.90      | 0.92      | 0.52      | 0.43                         | 0.67      | 0.83      | 0.56      | 0.77      | 0.64      | 0.67                  | 2.04             | 0.41                               | 0.47      | 0.43      |
|                        | Fall               | 0.74                     | 0.31      | 0.34      | 0.45      | 0.21                         | 0.33      | 0.64      | 0.39      | 0.40      | 0.49      | 0.66                  | 1.20             | 0.19                               | 0.32      | 0.44      |
|                        | Average            | 0.57                     | 0.51      | 0.50      | 0.44      | 0.28                         | 0.42      | 0.71      | 0.43      | 0.51      | 0.48      | 0.48                  | 1.34             | 0.27                               | 0.34      | 0.37      |
|                        | Standard Deviation | 0.20                     | 0.34      | 0.37      | 0.09      | 0.13                         | 0.22      | 0.10      | 0.11      | 0.23      | 0.16      | 0.33                  | 0.64             | 0.12                               | 0.12      | 0.11      |
|                        | Standard Error     | 0.12                     | 0.20      | 0.21      | 0.05      | 0.07                         | 0.12      | 0.06      | 0.06      | 0.13      | 0.09      | 0.19                  | 0.37             | 0.07                               | 0.07      | 0.07      |
| Phaeophytin-a (µg/L)   | Spring             | 0.40                     | <0.10     | 0.37      | 0.45      | 0.39                         | 0.51      | 0.52      | 0.42      | 0.42      | 0.37      | 0.37                  | 0.57             | 0.35                               | 0.37      | 0.32      |
|                        | Summer             | 1.17                     | 1.50      | 1.60      | 1.36      | 1.16                         | 1.24      | 1.37      | 1.01      | 1.48      | 1.17      | 1.05                  | 1.75             | 1.23                               | 1.10      | 0.97      |
|                        | Fall               | 0.78                     | 0.46      | 0.57      | 0.58      | 0.69                         | 0.51      | 0.61      | 0.54      | 0.54      | 0.57      | 0.63                  | 0.82             | 0.40                               | 0.43      | 0.52      |
|                        | Average            | 0.78                     | 0.69      | 0.85      | 0.80      | 0.75                         | 0.75      | 0.83      | 0.66      | 0.81      | 0.70      | 0.68                  | 1.05             | 0.66                               | 0.63      | 0.60      |
|                        | Standard Deviation | 0.39                     | 0.73      | 0.66      | 0.49      | 0.39                         | 0.42      | 0.47      | 0.31      | 0.58      | 0.42      | 0.34                  | 0.62             | 0.49                               | 0.41      | 0.33      |
|                        | Standard Error     | 0.22                     | 0.42      | 0.38      | 0.28      | 0.22                         | 0.24      | 0.27      | 0.18      | 0.34      | 0.24      | 0.20                  | 0.36             | 0.29                               | 0.23      | 0.19      |

**Table E.2: Chlorophyll-a Concentration (µg/L) Data Summary and Statistical Comparison Results between Camp Lake Tributary 1 Main Stem Stations and Lotic Reference Creek Stations for Spring, Summer and Fall Sampling Events in 2020**

| Season | Two-Area Comparison                   |         |                               | Study Area     | Sample Size | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
|--------|---------------------------------------|---------|-------------------------------|----------------|-------------|-------|--------------------|----------------|---------|---------|
|        | Significant Difference between Areas? | P-value | Statistical Test <sup>a</sup> |                |             |       |                    |                |         |         |
| Spring | NO                                    | 0.226   | tequal                        | Reference      | 4           | 0.310 | 0.050              | 0.025          | 0.240   | 0.350   |
|        |                                       |         |                               | CLT1 Main Stem | 4           | 0.422 | 0.159              | 0.080          | 0.320   | 0.660   |
| Summer | NO                                    | 0.745   | tequal                        | Reference      | 4           | 0.740 | 0.201              | 0.100          | 0.520   | 0.920   |
|        |                                       |         |                               | CLT1 Main Stem | 4           | 0.700 | 0.122              | 0.061          | 0.560   | 0.830   |
| Fall   | NO                                    | 0.866   | tequal                        | Reference      | 4           | 0.460 | 0.196              | 0.098          | 0.310   | 0.740   |
|        |                                       |         |                               | CLT1 Main Stem | 4           | 0.480 | 0.116              | 0.058          | 0.390   | 0.640   |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

<sup>a</sup> Statistical test was T-test (tequal) for comparisons between Lotic Reference Creek and Camp Lake Tributary 1 Main Stem Stations within a season.

<sup>1</sup> Data analysis included: α - data untransformed, single factor ANOVA test conducted; β - data log-transformed, single factor ANOVA test conducted; γ - data untransformed, Mann-Whitney U-test conducted; ζ - data untransformed, t-test assuming unequal variance conducted; η - data log-transformed, t-test assuming unequal variance conducted.

**Table E.3: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Reference Lake 3 (REF-03), Mary River Project 2020 CREMP**

| Analyte                |         | Chlorophyll-a (µg/L) |         |         |         |                    |                | Phaeophytin-a (µg/L) |         |         |         |                    |                |
|------------------------|---------|----------------------|---------|---------|---------|--------------------|----------------|----------------------|---------|---------|---------|--------------------|----------------|
| Station                |         | REF3-01              | REF3-02 | REF3-03 | Average | Standard Deviation | Standard Error | REF3-01              | REF3-02 | REF3-03 | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Summer  | 2-Aug-20             |         |         | -       | -                  | -              | 2-Aug-20             |         |         | -       | -                  | -              |
|                        | Fall    | 29-Aug-20            |         |         | -       | -                  | -              | 29-Aug-20            |         |         | -       | -                  | -              |
| Summer                 | Surface | 0.62                 | 0.61    | 0.69    | 0.64    | 0.04               | 0.03           | 1.29                 | 1.22    | 1.35    | 1.29    | 0.07               | 0.04           |
|                        | Bottom  | 1.06                 | 1.02    | 0.68    | 0.92    | 0.21               | 0.12           | 1.65                 | 1.47    | 1.38    | 1.50    | 0.14               | 0.08           |
|                        | Average | 0.84                 | 0.82    | 0.69    | 0.78    | 0.08               | 0.05           | 1.47                 | 1.35    | 1.37    | 1.39    | 0.07               | 0.04           |
| Fall                   | Surface | 0.59                 | 0.53    | 0.59    | 0.57    | 0.03               | 0.02           | 0.56                 | 0.57    | 0.54    | 0.56    | 0.02               | 0.01           |
|                        | Bottom  | 0.62                 | 0.70    | 0.60    | 0.64    | 0.05               | 0.03           | 0.58                 | 0.68    | 0.59    | 0.62    | 0.06               | 0.03           |
|                        | Average | 0.61                 | 0.62    | 0.60    | 0.61    | 0.01               | 0.01           | 0.57                 | 0.63    | 0.57    | 0.59    | 0.03               | 0.02           |

**Table E.4: Statistical Comparisons of Chlorophyll-a Concentrations Among Years at Reference Lake 3, Mary River Project CREMP, 2020**

| Season | Data Transformation | Overall 5-group Comparison          |         |                                    | Summary |                 |                           |                           | Pairwise Comparison <sup>b</sup> |
|--------|---------------------|-------------------------------------|---------|------------------------------------|---------|-----------------|---------------------------|---------------------------|----------------------------------|
|        |                     | Significant Difference Among Years? | P-value | Statistical Treatment <sup>a</sup> | Year    | Sample Size (n) | Mean Concentration (mg/L) | Standard Deviation (mg/L) |                                  |
| Summer | rank                | YES                                 | 0.047   | K-W                                | 2015    | 3               | 0.899                     | 0.146                     | AB                               |
|        |                     |                                     |         |                                    | 2016    | 3               | 0.922                     | 0.0845                    | A                                |
|        |                     |                                     |         |                                    | 2017    | 3               | 0.634                     | 0.0899                    | C                                |
|        |                     |                                     |         |                                    | 2018    | 3               | 0.742                     | 0.0660                    | BC                               |
|        |                     |                                     |         |                                    | 2019    | 3               | 0.680                     | 0.213                     | BC                               |
|        |                     |                                     |         |                                    | 2020    | 6               | 0.780                     | 0.0744                    | ABC                              |
| Fall   | rank                | YES                                 | 0.003   | K-W                                | 2015    | 3               | 1.06                      | 0.363                     | AB                               |
|        |                     |                                     |         |                                    | 2016    | 3               | 0.738                     | 0.0708                    | ABC                              |
|        |                     |                                     |         |                                    | 2017    | 3               | 0.913                     | 0.0189                    | A                                |
|        |                     |                                     |         |                                    | 2018    | 3               | 0.907                     | 0.0388                    | A                                |
|        |                     |                                     |         |                                    | 2019    | 3               | 0.680                     | 0.0695                    | BC                               |
|        |                     |                                     |         |                                    | 2020    | 6               | 0.605                     | 0.00894                   | C                                |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

<sup>a</sup> The statistical test was A Kruskal Wallis H-test (KW H-test) for differences among 5 years.

<sup>b</sup> Annual data sets sharing the same letter do not differ significantly.

**Table E.5: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Camp Lake (JLO), Mary River Project CREMP, 2020**

| Analyte                |         | Chlorophyll-a (µg/L) |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | JL0-02               | JL0-10    | JL0-01    | JL0-07    | JL0-09    | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 12-Apr-20            | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | -       | -                  | -              |
|                        | Summer  | 29-Jul-20            | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | -       | -                  | -              |
|                        | Fall    | 30-Aug-20            | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 1.37                 | 0.41      | 0.99      | 0.59      | 0.31      | 0.73    | 0.44               | 0.20           |
|                        | Bottom  | 0.31                 | 0.24      | 0.14      | 0.14      | 0.18      | 0.20    | 0.07               | 0.03           |
|                        | Average | 0.84                 | 0.33      | 0.57      | 0.37      | 0.25      | 0.47    | 0.24               | 0.11           |
| Summer                 | Surface | 1.31                 | 1.39      | 1.07      | 0.94      | 0.77      | 1.10    | 0.26               | 0.11           |
|                        | Bottom  | 1.62                 | 2.02      | 0.96      | 1.05      | 0.78      | 1.29    | 0.52               | 0.23           |
|                        | Average | 1.47                 | 1.71      | 1.02      | 1.00      | 0.78      | 1.19    | 0.38               | 0.17           |
| Fall                   | Surface | 0.87                 | 0.99      | <0.10     | 1.34      | 1.16      | 0.89    | 0.48               | 0.21           |
|                        | Bottom  | 1.31                 | 1.46      | 1.31      | 0.90      | 1.13      | 1.22    | 0.21               | 0.10           |
|                        | Average | 1.09                 | 1.23      | 0.71      | 1.12      | 1.15      | 1.06    | 0.20               | 0.09           |

| Analyte                |         | Phaeophytin-a (µg/L) |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | JL0-02               | JL0-10    | JL0-01    | JL0-07    | JL0-09    | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 12-Apr-20            | 13-Apr-20 | 13-Apr-20 | 13-Apr-20 | 14-Apr-20 | -       | -                  | -              |
|                        | Summer  | 29-Jul-20            | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | 29-Jul-20 | -       | -                  | -              |
|                        | Fall    | 30-Aug-20            | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | 30-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.68                 | 0.42      | 0.60      | 0.54      | 0.41      | 0.53    | 0.12               | 0.05           |
|                        | Bottom  | 0.38                 | 0.35      | 0.32      | 0.34      | 0.41      | 0.36    | 0.04               | 0.02           |
|                        | Average | 0.53                 | 0.39      | 0.46      | 0.44      | 0.41      | 0.45    | 0.06               | 0.02           |
| Summer                 | Surface | 1.11                 | 1.03      | 0.99      | 1.00      | 0.88      | 1.00    | 0.08               | 0.04           |
|                        | Bottom  | 1.29                 | 1.47      | 0.68      | 0.92      | 0.78      | 1.03    | 0.34               | 0.15           |
|                        | Average | 1.20                 | 1.25      | 0.84      | 0.96      | 0.83      | 1.02    | 0.20               | 0.09           |
| Fall                   | Surface | 0.65                 | 0.73      | 0.25      | 0.99      | 1.02      | 0.73    | 0.31               | 0.14           |
|                        | Bottom  | 0.87                 | 0.90      | 0.92      | 0.77      | 0.81      | 0.85    | 0.06               | 0.03           |
|                        | Average | 0.76                 | 0.82      | 0.59      | 0.88      | 0.92      | 0.79    | 0.13               | 0.06           |

**Table E.6: Statistical Comparisons of Chlorophyll-a Concentrations Among Winter, Spring, Summer and/or Fall Sampling Events at Mine-Exposed and Reference Creek and Lake Study Areas, Mary River Project CREMP, 2020**

| Study Area                          | Overall 3-group Comparison            |         |                               | Pair-wise, <i>post hoc</i> comparisons <sup>a</sup> |            |                                           |         |
|-------------------------------------|---------------------------------------|---------|-------------------------------|-----------------------------------------------------|------------|-------------------------------------------|---------|
|                                     | Significant Difference Among Seasons? | P-value | Statistical Test <sup>b</sup> | (I) Season                                          | (J) Season | Significant Difference Between 3 Seasons? | P-value |
| Reference Creek Stations            | YES                                   | 0.036   | K-W                           | Spring                                              | Summer     | YES                                       | 0.011   |
|                                     |                                       |         |                               | Spring                                              | Fall       | NO                                        | 0.325   |
|                                     |                                       |         |                               | Summer                                              | Fall       | NO                                        | 0.115   |
| Mary River GO-09 Reference Stations | YES                                   | 0.027   | K-W                           | Spring                                              | Summer     | YES                                       | 0.007   |
|                                     |                                       |         |                               | Spring                                              | Fall       | NO                                        | 0.180   |
|                                     |                                       |         |                               | Summer                                              | Fall       | NO                                        | 0.180   |
| Reference Lake 3                    | YES                                   | 0.022   | tequal                        | Winter                                              | Summer     | YES                                       | 0.022   |
|                                     |                                       |         |                               | Winter                                              | Fall       | YES                                       | 0.022   |
|                                     |                                       |         |                               | Summer                                              | Fall       | YES                                       | 0.022   |
| Camp Lake                           | YES                                   | 0.004   | ANOVA                         | Winter                                              | Summer     | YES                                       | 0.004   |
|                                     |                                       |         |                               | Winter                                              | Fall       | YES                                       | 0.004   |
|                                     |                                       |         |                               | Summer                                              | Fall       | NO                                        | 0.743   |
| Sheardown Lake NW                   | YES                                   | 0.003   | K-W                           | Winter                                              | Summer     | YES                                       | 0.027   |
|                                     |                                       |         |                               | Winter                                              | Fall       | YES                                       | <0.001  |
|                                     |                                       |         |                               | Summer                                              | Fall       | NO                                        | 0.279   |
| Sheardown Lake SE                   | YES                                   | 0.002   | K-W                           | Winter                                              | Summer     | YES                                       | <0.001  |
|                                     |                                       |         |                               | Winter                                              | Fall       | YES                                       | 0.066   |
|                                     |                                       |         |                               | Summer                                              | Fall       | NO                                        | 0.104   |
| Mary Lake North Basin               | YES                                   | 0.002   | ANOVA                         | Winter                                              | Summer     | YES                                       | 0.002   |
|                                     |                                       |         |                               | Winter                                              | Fall       | YES                                       | 0.033   |
|                                     |                                       |         |                               | Summer                                              | Fall       | YES                                       | 0.061   |
| Mary Lake South Basin               | YES                                   | 0.003   | K-W                           | Winter                                              | Summer     | YES                                       | 0.001   |
|                                     |                                       |         |                               | Winter                                              | Fall       | NO                                        | 0.477   |
|                                     |                                       |         |                               | Summer                                              | Fall       | YES                                       | 0.012   |

<sup>a</sup> *Post hoc* analysis of 1-way ANOVA among all areas protected for multiple comparisons.

<sup>b</sup> Statistical tests include Analysis of Variance (ANOVA), Kruskal Wallis H-test (KW H-test) for differences among three seasons within each station and T-test (tequal) for Reference Lake 3 when only two seasons were sampled.

**Table E.7: Summary Data and Statistical Results for Chlorophyll-a Concentration (mg/L) Comparisons between Individual Mine-Exposed Lakes and Reference Lake 3 for Summer Sampling, Mary River Project CREMP, 2020**

| Study Lake        | Two-Group Comparison to Reference     |         |                               |                                      | Number of Stations (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
|-------------------|---------------------------------------|---------|-------------------------------|--------------------------------------|------------------------|-------|--------------------|----------------|---------|---------|
|                   | Significant Difference between Areas? | P-value | Statistical Test <sup>a</sup> | Magnitude of Difference <sup>b</sup> |                        |       |                    |                |         |         |
| Reference Lake 03 | -                                     | -       | -                             | -                                    | 3                      | 0.780 | 0.0832             | 0.0480         | 0.685   | 0.840   |
| Camp Lake         | NO                                    | 0.143   | M-W                           | 5.4                                  | 5                      | 1.19  | 0.381              | 0.171          | 0.775   | 1.71    |
| Sheardown Lake NW | YES                                   | 0.048   | M-W                           | 16                                   | 6                      | 2.45  | 2.92               | 1.19           | 0.835   | 8.36    |
| Sheardown Lake SE | YES                                   | 0.036   | M-W                           | 33                                   | 5                      | 1.92  | 0.306              | 0.137          | 1.43    | 2.19    |
| Mary Lake North   | NO                                    | 0.100   | M-W                           | 29                                   | 3                      | 1.67  | 0.475              | 0.275          | 1.12    | 2.00    |
| Mary Lake South   | YES                                   | 0.017   | M-W                           | 4.0                                  | 7                      | 1.01  | 0.134              | 0.0506         | 0.860   | 1.22    |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

<sup>a</sup> Statistical Test was Mann-Whitney (M-W) U-test between individual mine-exposed lakes and Reference Lake 3.

<sup>b</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.

**Table E.8: Summary Data and Statistical Results for Chlorophyll-a Concentration (mg/L) Comparisons between Individual Mine-Exposed Lakes and Reference Lake 3 for Fall Sampling, Mary River Project CREMP, 2020**

| Study Lake        | Two-Group Comparison to Reference     |         |                               |                                      | Number of Stations (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
|-------------------|---------------------------------------|---------|-------------------------------|--------------------------------------|------------------------|-------|--------------------|----------------|---------|---------|
|                   | Significant Difference between Areas? | P-value | Statistical Test <sup>a</sup> | Magnitude of Difference <sup>b</sup> |                        |       |                    |                |         |         |
| Reference Lake 3  | -                                     | -       | -                             | -                                    | 3                      | 0.605 | 0.0100             | 0.00577        | 0.595   | 0.615   |
| Camp Lake         | YES                                   | 0.036   | M-W                           | 35                                   | 5                      | 1.06  | 0.203              | 0.0908         | 0.705   | 1.23    |
| Sheardown Lake NW | YES                                   | <0.001  | tequal                        | 66                                   | 6                      | 1.79  | 0.129              | 0.0527         | 1.67    | 1.97    |
| Sheardown Lake SE | YES                                   | <0.001  | tequal                        | 48                                   | 5                      | 1.35  | 0.0767             | 0.0343         | 1.27    | 1.46    |
| Mary Lake North   | NO                                    | 0.100   | M-W                           | 28                                   | 3                      | 1.01  | 0.0275             | 0.0159         | 0.975   | 1.02    |
| Mary Lake South   | NO                                    | 0.295   | tequal                        | 4.2                                  | 7                      | 0.651 | 0.0690             | 0.0261         | 0.580   | 0.780   |

 Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

<sup>a</sup> Statistical Test were Mann-Whitney U-test (M-W) or T-test (tequal) between individual mine-exposed lakes and Reference Lake 3.

<sup>b</sup> Magnitude calculated by comparing the difference between the reference area and mine-exposed area means divided by the reference area standard deviation.



**Table E.9: Statistical Comparison of Chlorophyll-a Concentrations at Camp Lake Among Years of Mine Operation (2015 to 2020)**

| Season | Data Transform-ation | Statistical Test <sup>a</sup> | Overall 7-Year Comparison           |         | Pair-wise, post-hoc comparisons <sup>b</sup> |                 |       |                    |                                  |
|--------|----------------------|-------------------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|----------------------------------|
|        |                      |                               | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Pairwise Comparison <sup>c</sup> |
| Winter | log10                | ANOVA                         | YES                                 | <0.001  | 2014                                         | 4               | 0.275 | 0.150              | C                                |
|        |                      |                               |                                     |         | 2015                                         | 5               | 0.742 | 0.152              | A                                |
|        |                      |                               |                                     |         | 2016                                         | 5               | 0.645 | 0.120              | AB                               |
|        |                      |                               |                                     |         | 2017                                         | 5               | 0.316 | 0.108              | C                                |
|        |                      |                               |                                     |         | 2018                                         | 5               | 0.384 | 0.0414             | BC                               |
|        |                      |                               |                                     |         | 2019                                         | 5               | 0.474 | 0.123              | ABC                              |
|        |                      |                               |                                     |         | 2020                                         | 10              | 0.468 | 0.225              | BC                               |
| Summer | rank                 | K-W                           | YES                                 | 0.004   | 2014                                         | 2               | 1.05  | 1.20               | BC                               |
|        |                      |                               |                                     |         | 2015                                         | 5               | 1.26  | 0.163              | B                                |
|        |                      |                               |                                     |         | 2016                                         | 5               | 1.50  | 0.319              | AB                               |
|        |                      |                               |                                     |         | 2017                                         | 5               | 1.24  | 0.154              | BC                               |
|        |                      |                               |                                     |         | 2018                                         | 5               | 2.00  | 0.0351             | A                                |
|        |                      |                               |                                     |         | 2019                                         | 5               | 0.875 | 0.288              | C                                |
|        |                      |                               |                                     |         | 2020                                         | 10              | 1.19  | 0.360              | BC                               |
| Fall   | log10                | ANOVA                         | YES                                 | <0.001  | 2014                                         | 5               | 1.59  | 0.726              | B                                |
|        |                      |                               |                                     |         | 2015                                         | 5               | 0.650 | 0.0696             | D                                |
|        |                      |                               |                                     |         | 2016                                         | 5               | 1.06  | 0.214              | BCD                              |
|        |                      |                               |                                     |         | 2017                                         | 5               | 1.19  | 0.149              | BCD                              |
|        |                      |                               |                                     |         | 2018                                         | 5               | 2.15  | 0.0354             | A                                |
|        |                      |                               |                                     |         | 2019                                         | 5               | 1.28  | 0.252              | BC                               |
|        |                      |                               |                                     |         | 2020                                         | 10              | 1.06  | 0.191              | CD                               |
| Annual | rank                 | K-W                           | NO                                  | 0.224   | 2014                                         | 11              | 1.01  | 0.864              | A                                |
|        |                      |                               |                                     |         | 2015                                         | 15              | 0.884 | 0.305              | A                                |
|        |                      |                               |                                     |         | 2016                                         | 15              | 1.07  | 0.421              | A                                |
|        |                      |                               |                                     |         | 2017                                         | 15              | 0.915 | 0.458              | A                                |
|        |                      |                               |                                     |         | 2018                                         | 15              | 1.51  | 0.828              | A                                |
|        |                      |                               |                                     |         | 2019                                         | 15              | 0.875 | 0.402              | A                                |
|        |                      |                               |                                     |         | 2020                                         | 30              | 0.905 | 0.411              | A                                |

Indicates a statistically significant difference for respective comparison (p-value  $\leq 0.1$ ).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) or Kruskal Wallis H-test (KW) for differences among seven years.

<sup>b</sup> *Post hoc* analysis of 1-way ANOVA or Kruskal Wallis H-test (KW) among all years protected for multiple comparisons.

<sup>c</sup> Similar letter indicates no significant differences.

**Table E.10: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Sheardown Lake Northwest (DLO-01), Mary River Project CREMP, 2020**

| Analyte                |         | Chlorophyll-a (µg/L) |           |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | DD-HAB 9-STN1        | DL0-01-5  | DL0-01-1  | DL0-01-4  | DL0-01-2  | DL0-01-7  | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 17-Apr-20            | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 | -       | -                  | -              |
|                        | Summer  | 28-Jul-20            | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 | -       | -                  | -              |
|                        | Fall    | 26-Aug-20            | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.38                 | 0.84      | 0.30      | 0.35      | 1.83      | 0.69      | 0.73    | 0.58               | 0.24           |
|                        | Bottom  | 0.30                 | 0.17      | 0.18      | 0.52      | 0.19      | 0.19      | 0.26    | 0.14               | 0.06           |
|                        | Average | 0.34                 | 0.51      | 0.24      | 0.44      | 1.01      | 0.44      | 0.50    | 0.27               | 0.11           |
| Summer                 | Surface | 0.91                 | 1.02      | 0.98      | 15.0      | 0.87      | 1.47      | 3.38    | 5.70               | 2.33           |
|                        | Bottom  | 0.98                 | 0.65      | 2.08      | 1.72      | 1.70      | 2.04      | 1.53    | 0.58               | 0.24           |
|                        | Average | 0.95                 | 0.84      | 1.53      | 8.36      | 1.29      | 1.76      | 2.45    | 2.92               | 1.19           |
| Fall                   | Surface | 1.80                 | 1.75      | 1.81      | 1.55      | 2.08      | 1.73      | 1.79    | 0.17               | 0.07           |
|                        | Bottom  | 1.53                 | 2.14      | 1.73      | 1.87      | 1.85      | 1.69      | 1.80    | 0.21               | 0.08           |
|                        | Average | 1.67                 | 1.95      | 1.77      | 1.71      | 1.97      | 1.71      | 1.79    | 0.13               | 0.05           |

| Analyte                |         | Phaeophytin-a (µg/L) |           |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | DD-HAB 9-STN1        | DL0-01-5  | DL0-01-1  | DL0-01-4  | DL0-01-2  | DL0-01-7  | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 17-Apr-20            | 17-Apr-20 | 17-Apr-20 | 16-Apr-20 | 17-Apr-20 | 15-Apr-20 | -       | -                  | -              |
|                        | Summer  | 28-Jul-20            | 29-Jul-20 | 29-Jul-20 | 28-Jul-20 | 29-Jul-20 | 28-Jul-20 | -       | -                  | -              |
|                        | Fall    | 26-Aug-20            | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 27-Aug-20 | 26-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.37                 | 0.47      | 0.36      | 0.39      | 0.83      | 0.56      | 0.50    | 0.18               | 0.07           |
|                        | Bottom  | 0.40                 | 0.33      | 0.34      | 0.46      | 0.34      | 0.33      | 0.37    | 0.05               | 0.02           |
|                        | Average | 0.39                 | 0.40      | 0.35      | 0.43      | 0.59      | 0.45      | 0.43    | 0.08               | 0.03           |
| Summer                 | Surface | 0.70                 | 1.04      | 0.92      | 7.96      | 0.96      | 1.52      | 2.18    | 2.84               | 1.16           |
|                        | Bottom  | 0.67                 | 0.77      | 1.54      | 1.12      | 1.45      | 2.00      | 1.26    | 0.50               | 0.21           |
|                        | Average | 0.69                 | 0.91      | 1.23      | 4.54      | 1.21      | 1.76      | 1.72    | 1.43               | 0.58           |
| Fall                   | Surface | 0.99                 | 1.06      | 1.18      | 1.02      | 1.21      | 1.20      | 1.11    | 0.10               | 0.04           |
|                        | Bottom  | 0.76                 | 1.26      | 0.94      | 1.07      | 1.26      | 0.96      | 1.04    | 0.20               | 0.08           |
|                        | Average | 0.88                 | 1.16      | 1.06      | 1.05      | 1.24      | 1.08      | 1.08    | 0.12               | 0.05           |

**Table E.11: Statistical Comparison of Chlorophyll-a Concentrations at Sheardown Lake NW Among Years of Mine Operation (2015 to 2020)**

| Season | Data Transformation | Statistical Test <sup>a</sup> | Overall 7-Year Comparison           |         | Pair-wise, post-hoc comparisons <sup>b</sup> |                 |       |                    |                                  |
|--------|---------------------|-------------------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|----------------------------------|
|        |                     |                               | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Pairwise Comparison <sup>c</sup> |
| Winter | rank                | K-W                           | YES                                 | <0.001  | 2014                                         | 6               | 2.55  | 1.34               | A                                |
|        |                     |                               |                                     |         | 2015                                         | 6               | 1.10  | 0.0469             | AB                               |
|        |                     |                               |                                     |         | 2016                                         | 6               | 0.874 | 0.316              | B                                |
|        |                     |                               |                                     |         | 2017                                         | 6               | 0.790 | 0.268              | BC                               |
|        |                     |                               |                                     |         | 2018                                         | 6               | 1.03  | 0.495              | AB                               |
|        |                     |                               |                                     |         | 2019                                         | 6               | 0.463 | 0.235              | C                                |
|        |                     |                               |                                     |         | 2020                                         | 12              | 0.495 | 0.256              | C                                |
| Summer | rank                | K-W                           | YES                                 | 0.003   | 2014                                         | 6               | 2.42  | 0.821              | A                                |
|        |                     |                               |                                     |         | 2015                                         | 6               | 1.51  | 0.244              | BC                               |
|        |                     |                               |                                     |         | 2016                                         | 6               | 2.13  | 0.387              | A                                |
|        |                     |                               |                                     |         | 2017                                         | 6               | 1.22  | 0.126              | C                                |
|        |                     |                               |                                     |         | 2018                                         | 6               | 2.01  | 0.183              | A                                |
|        |                     |                               |                                     |         | 2019                                         | 6               | 1.81  | 0.246              | AB                               |
|        |                     |                               |                                     |         | 2020                                         | 12              | 2.45  | 2.78               | BC                               |
| Fall   | rank                | K-W                           | YES                                 | <0.001  | 2014                                         | 6               | 0.800 | 0.379              | D                                |
|        |                     |                               |                                     |         | 2015                                         | 6               | 1.61  | 0.44               | BC                               |
|        |                     |                               |                                     |         | 2016                                         | 6               | 1.53  | 0.183              | BC                               |
|        |                     |                               |                                     |         | 2017                                         | 6               | 1.56  | 0.222              | BC                               |
|        |                     |                               |                                     |         | 2018                                         | 6               | 1.75  | 0.136              | AB                               |
|        |                     |                               |                                     |         | 2019                                         | 6               | 1.19  | 0.309              | CD                               |
|        |                     |                               |                                     |         | 2020                                         | 12              | 1.79  | 0.123              | A                                |
| Annual | rank                | K-W                           | YES                                 | 0.071   | 2014                                         | 18              | 1.93  | 1.20               | A                                |
|        |                     |                               |                                     |         | 2015                                         | 18              | 1.41  | 0.355              | AB                               |
|        |                     |                               |                                     |         | 2016                                         | 18              | 1.51  | 0.602              | AB                               |
|        |                     |                               |                                     |         | 2017                                         | 18              | 1.19  | 0.381              | B                                |
|        |                     |                               |                                     |         | 2018                                         | 18              | 1.60  | 0.519              | A                                |
|        |                     |                               |                                     |         | 2019                                         | 18              | 1.15  | 0.618              | B                                |
|        |                     |                               |                                     |         | 2020                                         | 36              | 1.58  | 1.77               | B                                |

Indicates a statistically significant difference for respective comparison (p-value  $\leq 0.1$ ).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) or Kruskal Wallis H-test (KW) for differences among seven years.

<sup>b</sup> *Post hoc* analysis of 1-way ANOVA or Kruskal Wallis H-test (KW) among all years protected for multiple comparisons.

<sup>c</sup> Similar letter indicates no significant differences.

**Table E.12: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Sheardown Lake SE (DLO-02), Mary River Project CREMP, 2020**

| Analyte                |         | Chlorophyll-a (µg/L) |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | DL0-02-06            | DL0-02-07 | DL0-02-4  | DL0-02-8  | DL0-02-03 | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 15-Apr-20            | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | -       | -                  | -              |
|                        | Summer  | 28-Jul-20            | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | -       | -                  | -              |
|                        | Fall    | 26-Aug-20            | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.98                 | 0.95      | 1.11      | 1.42      | 1.81      | 1.25    | 0.36               | 0.16           |
|                        | Bottom  | 0.21                 | 0.96      | 0.64      | 0.28      | 0.23      | 0.46    | 0.33               | 0.15           |
|                        | Average | 0.60                 | 0.96      | 0.88      | 0.85      | 1.02      | 0.86    | 0.16               | 0.07           |
| Summer                 | Surface | 0.22                 | 1.45      | 2.16      | 3.05      | 1.60      | 1.70    | 1.04               | 0.46           |
|                        | Bottom  | 2.64                 | 2.93      | 1.91      | 1.18      | 2.03      | 2.14    | 0.68               | 0.31           |
|                        | Average | 1.43                 | 2.19      | 2.04      | 2.12      | 1.82      | 1.92    | 0.31               | 0.14           |
| Fall                   | Surface | 1.40                 | 1.39      | 1.38      | 1.25      | 1.41      | 1.37    | 0.07               | 0.03           |
|                        | Bottom  | 1.14                 | 1.35      | 1.36      | 1.32      | 1.51      | 1.34    | 0.13               | 0.06           |
|                        | Average | 1.27                 | 1.37      | 1.37      | 1.29      | 1.46      | 1.35    | 0.08               | 0.03           |

| Analyte                |         | Phaeophytin-a (µg/L) |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | DL0-02-06            | DL0-02-07 | DL0-02-4  | DL0-02-8  | DL0-02-03 | Average | Standard Deviation | Standard Error |
| Sample Collection Date | Winter  | 15-Apr-20            | 15-Apr-20 | 14-Apr-20 | 14-Apr-20 | 15-Apr-20 | -       | -                  | -              |
|                        | Summer  | 28-Jul-20            | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | 28-Jul-20 | -       | -                  | -              |
|                        | Fall    | 26-Aug-20            | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | 26-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.63                 | 0.69      | 1.05      | 1.00      | 1.01      | 0.88    | 0.20               | 0.09           |
|                        | Bottom  | 0.39                 | 0.71      | 0.68      | 0.44      | 0.39      | 0.52    | 0.16               | 0.07           |
|                        | Average | 0.51                 | 0.70      | 0.87      | 0.72      | 0.70      | 0.70    | 0.13               | 0.06           |
| Summer                 | Surface | 0.84                 | 1.89      | 1.97      | 2.21      | 1.93      | 1.77    | 0.53               | 0.24           |
|                        | Bottom  | 2.30                 | 3.14      | 1.77      | 1.90      | 1.90      | 2.20    | 0.56               | 0.25           |
|                        | Average | 1.57                 | 2.52      | 1.87      | 2.06      | 1.92      | 1.99    | 0.35               | 0.15           |
| Fall                   | Surface | 0.88                 | 0.81      | 0.77      | 0.91      | 0.86      | 0.85    | 0.06               | 0.03           |
|                        | Bottom  | 0.68                 | 0.90      | 0.89      | 0.83      | 0.93      | 0.85    | 0.10               | 0.04           |
|                        | Average | 0.78                 | 0.86      | 0.83      | 0.87      | 0.90      | 0.85    | 0.04               | 0.02           |

**Table E.13: Statistical Comparison of Chlorophyll-a Concentrations at Sheardown Lake SE Among Years of Mine Operation (2015 to 2020)**

| Season | Data Transform-ation | Statistical Test <sup>a</sup> | Overall 7-Year Comparison           |         | Pair-wise, post-hoc comparisons <sup>b</sup> |                 |       |                    |                                  |
|--------|----------------------|-------------------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|----------------------------------|
|        |                      |                               | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Pairwise Comparison <sup>c</sup> |
| Winter | log10                | ANOVA                         | YES                                 | <0.001  | 2014                                         | 5               | 2.67  | 1.01               | A                                |
|        |                      |                               |                                     |         | 2015                                         | 5               | 1.58  | 0.525              | BC                               |
|        |                      |                               |                                     |         | 2016                                         | 5               | 1.90  | 0.648              | AB                               |
|        |                      |                               |                                     |         | 2017                                         | 5               | 1.36  | 0.412              | BC                               |
|        |                      |                               |                                     |         | 2018                                         | 5               | 2.23  | 0.851              | AB                               |
|        |                      |                               |                                     |         | 2019                                         | 5               | 1.88  | 0.386              | AB                               |
|        |                      |                               |                                     |         | 2020                                         | 10              | 0.859 | 0.153              | C                                |
| Summer | rank                 | K-W                           | YES                                 | <0.001  | 2014                                         | 5               | 0.203 | 0.00437            | D                                |
|        |                      |                               |                                     |         | 2015                                         | 5               | 0.913 | 0.0705             | CD                               |
|        |                      |                               |                                     |         | 2016                                         | 5               | 1.51  | 0.208              | BC                               |
|        |                      |                               |                                     |         | 2017                                         | 5               | 1.37  | 0.156              | C                                |
|        |                      |                               |                                     |         | 2018                                         | 5               | 2.12  | 0.0728             | A                                |
|        |                      |                               |                                     |         | 2019                                         | 5               | 2.16  | 0.242              | A                                |
|        |                      |                               |                                     |         | 2020                                         | 10              | 1.92  | 0.289              | AB                               |
| Fall   | rank                 | K-W                           | YES                                 | <0.001  | 2014                                         | 5               | 1.54  | 1.63               | CD                               |
|        |                      |                               |                                     |         | 2015                                         | 5               | 0.992 | 0.103              | D                                |
|        |                      |                               |                                     |         | 2016                                         | 5               | 2.87  | 0.737              | A                                |
|        |                      |                               |                                     |         | 2017                                         | 5               | 1.50  | 0.0757             | BC                               |
|        |                      |                               |                                     |         | 2018                                         | 5               | 2.03  | 0.115              | AB                               |
|        |                      |                               |                                     |         | 2019                                         | 5               | 2.00  | 0.446              | AB                               |
|        |                      |                               |                                     |         | 2020                                         | 10              | 1.35  | 0.0723             | CD                               |
| Annual | rank                 | K-W                           | YES                                 | <0.001  | 2014                                         | 15              | 1.47  | 1.46               | B                                |
|        |                      |                               |                                     |         | 2015                                         | 15              | 1.16  | 0.420              | B                                |
|        |                      |                               |                                     |         | 2016                                         | 15              | 2.09  | 0.798              | A                                |
|        |                      |                               |                                     |         | 2017                                         | 15              | 1.41  | 0.248              | B                                |
|        |                      |                               |                                     |         | 2018                                         | 15              | 2.13  | 0.468              | A                                |
|        |                      |                               |                                     |         | 2019                                         | 15              | 2.01  | 0.362              | A                                |
|        |                      |                               |                                     |         | 2020                                         | 30              | 1.38  | 0.478              | B                                |

Indicates a statistically significant difference for respective comparison (p-value  $\leq 0.1$ ).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) or Kruskal Wallis H-test (KW) for differences among seven years.

<sup>b</sup> *Post hoc* analysis of 1-way ANOVA or Kruskal Wallis H-test (KW) among all years protected for multiple comparisons.

<sup>c</sup> Similar letter indicates no significant differences.

**Table E.14: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at the Mary River, Mary River Project CREMP, 2020**

| Station                |                    | Upstream Reference |           |           | Upstream Mine-Exposed |           |           |           |           |           |           | Downstream Mine-Exposed |           |           |
|------------------------|--------------------|--------------------|-----------|-----------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|
|                        |                    | G0-09-A            | G0-09     | G0-09-B   | G0-03                 | G0-01     | F0-01     | E0-10     | E0-03     | E0-21     | E0-20     | C0-10                   | C0-05     | C0-01     |
| Sample Collection Date | Spring             | 4-Jul-20           | 4-Jul-20  | 4-Jul-20  | 3-Jul-20              | 3-Jul-20  | 3-Jul-20  | 3-Jul-20  | 3-Jul-20  | 3-Jul-20  | 3-Jul-20  | 3-Jul-20                | 3-Jul-20  | 3-Jul-20  |
|                        | Summer             | 3-Aug-20           | 2-Aug-20  | 2-Aug-20  | 2-Aug-20              | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | 31-Jul-20               | 31-Jul-20 | 31-Jul-20 |
|                        | Fall               | 28-Aug-20          | 28-Aug-20 | 28-Aug-20 | 28-Aug-20             | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20               | 28-Aug-20 | 28-Aug-20 |
| Chlorophyll-a (µg/L)   | Spring             | 0.24               | 0.25      | 0.27      | 0.51                  | 0.42      | 0.29      | 0.28      | 0.26      | 0.23      | <0.10     | 0.25                    | 0.54      | 0.48      |
|                        | Summer             | 0.66               | 0.71      | 0.93      | 0.79                  | 0.52      | 0.41      | 0.60      | 0.60      | 0.56      | 0.68      | 0.53                    | 0.69      | 0.64      |
|                        | Fall               | 0.33               | 0.43      | 0.34      | 0.73                  | 0.27      | 0.33      | 0.28      | 0.30      | 0.34      | 0.32      | 0.35                    | 0.38      | 0.33      |
|                        | Average            | 0.41               | 0.46      | 0.51      | 0.68                  | 0.40      | 0.34      | 0.39      | 0.39      | 0.38      | 0.37      | 0.38                    | 0.54      | 0.48      |
|                        | Standard Deviation | 0.22               | 0.23      | 0.36      | 0.15                  | 0.13      | 0.06      | 0.18      | 0.19      | 0.17      | 0.29      | 0.14                    | 0.16      | 0.16      |
|                        | Standard Error     | 0.13               | 0.13      | 0.21      | 0.09                  | 0.073     | 0.04      | 0.11      | 0.11      | 0.10      | 0.17      | 0.08                    | 0.09      | 0.09      |
| Phaeophytin-a (µg/L)   | Spring             | 0.35               | 0.66      | 0.43      | 0.44                  | 0.43      | 0.34      | 0.39      | 0.37      | 0.35      | 0.39      | 0.36                    | 0.48      | 0.48      |
|                        | Summer             | 1.34               | 1.45      | 1.70      | 1.70                  | 1.46      | 1.02      | 1.59      | 1.58      | 1.75      | 1.69      | 0.88                    | 1.26      | 1.03      |
|                        | Fall               | 0.85               | 0.84      | 0.99      | 1.01                  | 0.68      | 0.75      | 0.71      | 0.76      | 0.78      | 0.78      | 0.73                    | 0.74      | 0.66      |
|                        | Average            | 0.85               | 0.98      | 1.04      | 1.05                  | 0.86      | 0.70      | 0.90      | 0.90      | 0.96      | 0.95      | 0.66                    | 0.83      | 0.72      |
|                        | Standard Deviation | 0.50               | 0.41      | 0.64      | 0.63                  | 0.54      | 0.34      | 0.62      | 0.62      | 0.72      | 0.67      | 0.27                    | 0.40      | 0.28      |
|                        | Standard Error     | 0.29               | 0.24      | 0.37      | 0.36                  | 0.31      | 0.20      | 0.36      | 0.357     | 0.41      | 0.39      | 0.15                    | 0.23      | 0.16      |

**Table E.15: Phytoplankton Monitoring Data (i.e., chlorophyll-a and phaeophytin-a concentrations) Collected at Mary Lake (north and south basins; BLO), Mary River Project CREMP, 2020**

| Analyte                |         | Chlorophyll-a (µg/L) |           |           |                 |           |           |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | Mary Lake North      |           |           | Mary Lake South |           |           |           |           |           |           | Average | Standard Deviation | Standard Error |
|                        |         | BL0-01A              | BL0-01    | BL0-01B   | BL0-05-A        | BL0-05    | BL0-05-B  | BL0-03    | BL0-04    | BL0-09    | BL0-06    |         |                    |                |
| Sample Collection Date | Winter  | 19-Apr-20            | 19-Apr-20 | 19-Apr-20 | 21-Apr-20       | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | -       | -                  | -              |
|                        | Summer  | 30-Jul-20            | 30-Jul-20 | 30-Jul-20 | 1-Aug-20        | 1-Aug-20  | 1-Aug-20  | 31-Jul-20 | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | -       | -                  | -              |
|                        | Fall    | 27-Aug-20            | 27-Aug-20 | 27-Aug-20 | 28-Aug-20       | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.22                 | 0.48      | 0.25      | 0.90            | 0.80      | 1.27      | 0.52      | 0.89      | 1.54      | 0.70      | 0.76    | 0.42               | 0.13           |
|                        | Bottom  | <0.10                | <0.10     | 0.26      | 0.13            | 0.17      | 0.72      | 0.12      | 0.14      | 0.18      | 0.21      | 0.21    | 0.19               | 0.06           |
|                        | Average | 0.16                 | 0.29      | 0.26      | 0.52            | 0.49      | 1.00      | 0.32      | 0.52      | 0.86      | 0.46      | 0.49    | 0.26               | 0.08           |
| Summer                 | Surface | 1.46                 | 1.69      | 1.83      | 0.93            | 0.86      | 1.00      | 1.69      | 1.40      | 1.40      | 1.25      | 1.35    | 0.34               | 0.11           |
|                        | Bottom  | 0.78                 | 2.30      | 1.93      | 0.83            | 0.86      | 1.08      | 0.74      | 0.53      | 0.48      | 1.04      | 1.06    | 0.59               | 0.19           |
|                        | Average | 1.12                 | 2.00      | 1.88      | 0.88            | 0.86      | 1.04      | 1.22      | 0.97      | 0.94      | 1.15      | 1.20    | 0.40               | 0.13           |
| Fall                   | Surface | 0.99                 | 1.12      | 1.02      | 0.49            | 0.57      | 0.50      | 0.72      | 0.61      | 0.57      | 0.69      | 0.73    | 0.23               | 0.07           |
|                        | Bottom  | 0.96                 | 0.93      | 1.02      | 0.76            | 0.59      | 0.83      | 0.84      | 0.63      | 0.62      | 0.70      | 0.79    | 0.15               | 0.05           |
|                        | Average | 0.98                 | 1.03      | 1.02      | 0.63            | 0.58      | 0.67      | 0.78      | 0.62      | 0.60      | 0.70      | 0.76    | 0.18               | 0.06           |

| Analyte                |         | Phaeophytin-a (µg/L) |           |           |                 |           |           |           |           |           |           |         |                    |                |
|------------------------|---------|----------------------|-----------|-----------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|---------|--------------------|----------------|
| Station                |         | Mary Lake North      |           |           | Mary Lake South |           |           |           |           |           |           | Average | Standard Deviation | Standard Error |
|                        |         | BL0-01-A             | BL0-01    | BL0-01-B  | BL0-05-A        | BL0-05    | BL0-05-B  | BL0-03    | BL0-04    | BL0-09    | BL0-06    |         |                    |                |
| Sample Collection Date | Winter  | 19-Apr-20            | 19-Apr-20 | 19-Apr-20 | 21-Apr-20       | 21-Apr-20 | 21-Apr-20 | 19-Apr-20 | 20-Apr-20 | 20-Apr-20 | 20-Apr-20 | -       | -                  | -              |
|                        | Summer  | 30-Jul-20            | 30-Jul-20 | 30-Jul-20 | 1-Aug-20        | 1-Aug-20  | 1-Aug-20  | 31-Jul-20 | 1-Aug-20  | 1-Aug-20  | 1-Aug-20  | -       | -                  | -              |
|                        | Fall    | 27-Aug-20            | 27-Aug-20 | 27-Aug-20 | 28-Aug-20       | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | 28-Aug-20 | -       | -                  | -              |
| Winter                 | Surface | 0.29                 | 0.43      | 0.30      | 0.61            | 0.55      | 0.75      | 0.38      | 0.58      | 0.77      | 0.60      | 0.53    | 0.17               | 0.05           |
|                        | Bottom  | 0.29                 | 0.27      | 0.34      | 0.35            | 0.39      | 0.62      | 0.29      | 0.32      | 0.35      | 0.41      | 0.36    | 0.10               | 0.03           |
|                        | Average | 0.29                 | 0.35      | 0.32      | 0.48            | 0.47      | 0.69      | 0.34      | 0.45      | 0.56      | 0.51      | 0.44    | 0.12               | 0.04           |
| Summer                 | Surface | 1.15                 | 1.09      | 1.32      | 1.40            | 1.31      | 1.57      | 1.48      | 1.65      | 1.67      | 1.42      | 1.41    | 0.20               | 0.06           |
|                        | Bottom  | 1.14                 | 1.70      | 2.00      | 1.24            | 1.33      | 1.47      | 0.89      | 1.23      | 1.10      | 1.64      | 1.37    | 0.33               | 0.10           |
|                        | Average | 1.15                 | 1.40      | 1.66      | 1.32            | 1.32      | 1.52      | 1.19      | 1.44      | 1.39      | 1.53      | 1.39    | 0.16               | 0.05           |
| Fall                   | Surface | 0.76                 | 0.79      | 0.82      | 0.80            | 0.96      | 0.76      | 0.87      | 0.93      | 0.82      | 0.92      | 0.84    | 0.07               | 0.02           |
|                        | Bottom  | 0.85                 | 0.73      | 0.84      | 1.05            | 0.92      | 0.99      | 1.30      | 0.90      | 0.99      | 0.87      | 0.94    | 0.15               | 0.05           |
|                        | Average | 0.81                 | 0.76      | 0.83      | 0.93            | 0.94      | 0.88      | 1.09      | 0.92      | 0.91      | 0.90      | 0.89    | 0.09               | 0.03           |

**Table E.16: Statistical Comparison of Chlorophyll-a Concentrations at the Mary Lake North Basin Among Years of Mine Operation (2015 to 2020)**

| Season | Data Transformation | Statistical Test <sup>a</sup> | Overall 7-Year Comparison           |         | Pair-wise, post-hoc comparisons <sup>b</sup> |                 |       |                    |                                  |
|--------|---------------------|-------------------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|----------------------------------|
|        |                     |                               | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Pairwise Comparison <sup>c</sup> |
| Winter | rank                | K-W                           | NO                                  | 0.216   | 2014                                         | 3               | 0.585 | 0.663              | A                                |
|        |                     |                               |                                     |         | 2015                                         | 3               | 0.652 | 0.684              | A                                |
|        |                     |                               |                                     |         | 2016                                         | 2               | 0.182 | 0.0247             | A                                |
|        |                     |                               |                                     |         | 2017                                         | 3               | 0.178 | 0.0553             | A                                |
|        |                     |                               |                                     |         | 2018                                         | 3               | 0.197 | 0.0425             | A                                |
|        |                     |                               |                                     |         | 2019                                         | 3               | 0.498 | 0.422              | A                                |
|        |                     |                               |                                     |         | 2020                                         | 6               | 0.235 | 0.0602             | A                                |
| Summer | rank                | K-W                           | YES                                 | 0.010   | 2014                                         | 3               | 0.917 | 0.725              | BC                               |
|        |                     |                               |                                     |         | 2015                                         | 3               | 0.827 | 0.246              | BC                               |
|        |                     |                               |                                     |         | 2016                                         | 3               | 1.16  | 0.0961             | AB                               |
|        |                     |                               |                                     |         | 2017                                         | 3               | 0.266 | 0.0166             | C                                |
|        |                     |                               |                                     |         | 2018                                         | 3               | 0.504 | 0.187              | C                                |
|        |                     |                               |                                     |         | 2019                                         | 3               | 0.737 | 0.118              | BC                               |
|        |                     |                               |                                     |         | 2020                                         | 6               | 1.67  | 0.425              | A                                |
| Fall   | rank                | K-W                           | YES                                 | 0.008   | 2014                                         | 3               | 0.517 | 0.252              | B                                |
|        |                     |                               |                                     |         | 2015                                         | 3               | 0.623 | 0.0718             | B                                |
|        |                     |                               |                                     |         | 2016                                         | 3               | 0.997 | 0.0909             | A                                |
|        |                     |                               |                                     |         | 2017                                         | 3               | 0.905 | 0.136              | A                                |
|        |                     |                               |                                     |         | 2018                                         | 3               | 0.860 | 0.0661             | AB                               |
|        |                     |                               |                                     |         | 2019                                         | 3               | 0.850 | 0.0757             | AB                               |
|        |                     |                               |                                     |         | 2020                                         | 6               | 1.01  | 0.0246             | A                                |
| Annual | rank                | K-W                           | NO                                  | 0.147   | 2014                                         | 9               | 0.673 | 0.54               | A                                |
|        |                     |                               |                                     |         | 2015                                         | 9               | 0.701 | 0.378              | A                                |
|        |                     |                               |                                     |         | 2016                                         | 8               | 0.854 | 0.427              | A                                |
|        |                     |                               |                                     |         | 2017                                         | 9               | 0.450 | 0.351              | A                                |
|        |                     |                               |                                     |         | 2018                                         | 9               | 0.520 | 0.305              | A                                |
|        |                     |                               |                                     |         | 2019                                         | 9               | 0.695 | 0.271              | A                                |
|        |                     |                               |                                     |         | 2020                                         | 18              | 0.969 | 0.645              | A                                |

Indicates a statistically significant difference for respective comparison (p-value  $\leq 0.1$ ).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) or Kruskal Wallis H-test (KW) for differences among seven years.

<sup>b</sup> *Post hoc* analysis of 1-way ANOVA or Kruskal Wallis H-test (KW) among all years protected for multiple comparisons.

<sup>c</sup> Similar letter indicates no significant differences.



**Table E.17: Statistical Comparison of Chlorophyll-a Concentrations at the Mary Lake South Basin Among Years of Mine Operation (2015 to 2020)**

| Season | Data Transformation | Statistical Test <sup>a</sup> | Overall 7-Year Comparison           |         | Pair-wise, post-hoc comparisons <sup>b</sup> |                 |       |                    |                                  |
|--------|---------------------|-------------------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|----------------------------------|
|        |                     |                               | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Pairwise Comparison <sup>c</sup> |
| Winter | rank                | K-W                           | YES                                 | 0.061   | 2014                                         | 7               | 0.879 | 1.46               | BC                               |
|        |                     |                               |                                     |         | 2015                                         | 7               | 0.646 | 0.340              | A                                |
|        |                     |                               |                                     |         | 2016                                         | 7               | 0.306 | 0.197              | C                                |
|        |                     |                               |                                     |         | 2017                                         | 7               | 0.351 | 0.209              | BC                               |
|        |                     |                               |                                     |         | 2018                                         | 7               | 0.532 | 0.337              | ABC                              |
|        |                     |                               |                                     |         | 2019                                         | 7               | 0.482 | 0.168              | AB                               |
|        |                     |                               |                                     |         | 2020                                         | 14              | 0.592 | 0.232              | A                                |
| Summer | rank                | K-W                           | YES                                 | <0.001  | 2014                                         | 7               | 0.864 | 0.594              | AB                               |
|        |                     |                               |                                     |         | 2015                                         | 7               | 0.789 | 0.116              | B                                |
|        |                     |                               |                                     |         | 2016                                         | 7               | 1.08  | 0.172              | A                                |
|        |                     |                               |                                     |         | 2017                                         | 7               | 0.802 | 0.0827             | B                                |
|        |                     |                               |                                     |         | 2018                                         | 7               | 0.848 | 0.218              | AB                               |
|        |                     |                               |                                     |         | 2019                                         | 7               | 0.521 | 0.0254             | C                                |
|        |                     |                               |                                     |         | 2020                                         | 14              | 1.01  | 0.129              | A                                |
| Fall   | rank                | K-W                           | YES                                 | <0.001  | 2014                                         | 7               | 0.75  | 0.294              | A                                |
|        |                     |                               |                                     |         | 2015                                         | 7               | 0.895 | 0.120              | AB                               |
|        |                     |                               |                                     |         | 2016                                         | 7               | 0.752 | 0.231              | A                                |
|        |                     |                               |                                     |         | 2017                                         | 7               | 0.75  | 0.0773             | AC                               |
|        |                     |                               |                                     |         | 2018                                         | 7               | 0.904 | 0.0252             | AB                               |
|        |                     |                               |                                     |         | 2019                                         | 7               | 0.934 | 0.0415             | B                                |
|        |                     |                               |                                     |         | 2020                                         | 14              | 0.651 | 0.0663             | C                                |
| Annual | rank                | K-W                           | NO                                  | 0.515   | 2014                                         | 21              | 0.831 | 0.878              | A                                |
|        |                     |                               |                                     |         | 2015                                         | 21              | 0.777 | 0.232              | A                                |
|        |                     |                               |                                     |         | 2016                                         | 21              | 0.711 | 0.376              | A                                |
|        |                     |                               |                                     |         | 2017                                         | 21              | 0.634 | 0.244              | A                                |
|        |                     |                               |                                     |         | 2018                                         | 21              | 0.762 | 0.277              | A                                |
|        |                     |                               |                                     |         | 2019                                         | 21              | 0.645 | 0.230              | A                                |
|        |                     |                               |                                     |         | 2020                                         | 42              | 0.75  | 0.241              | A                                |

Indicates a statistically significant difference for respective comparison (p-value  $\leq 0.1$ ).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) or Kruskal Wallis H-test (KW) for differences among seven years.

<sup>b</sup> *Post hoc* analysis of 1-way ANOVA or Kruskal Wallis H-test (KW) among all years protected for multiple comparisons.

<sup>c</sup> Similar letter indicates no significant differences.

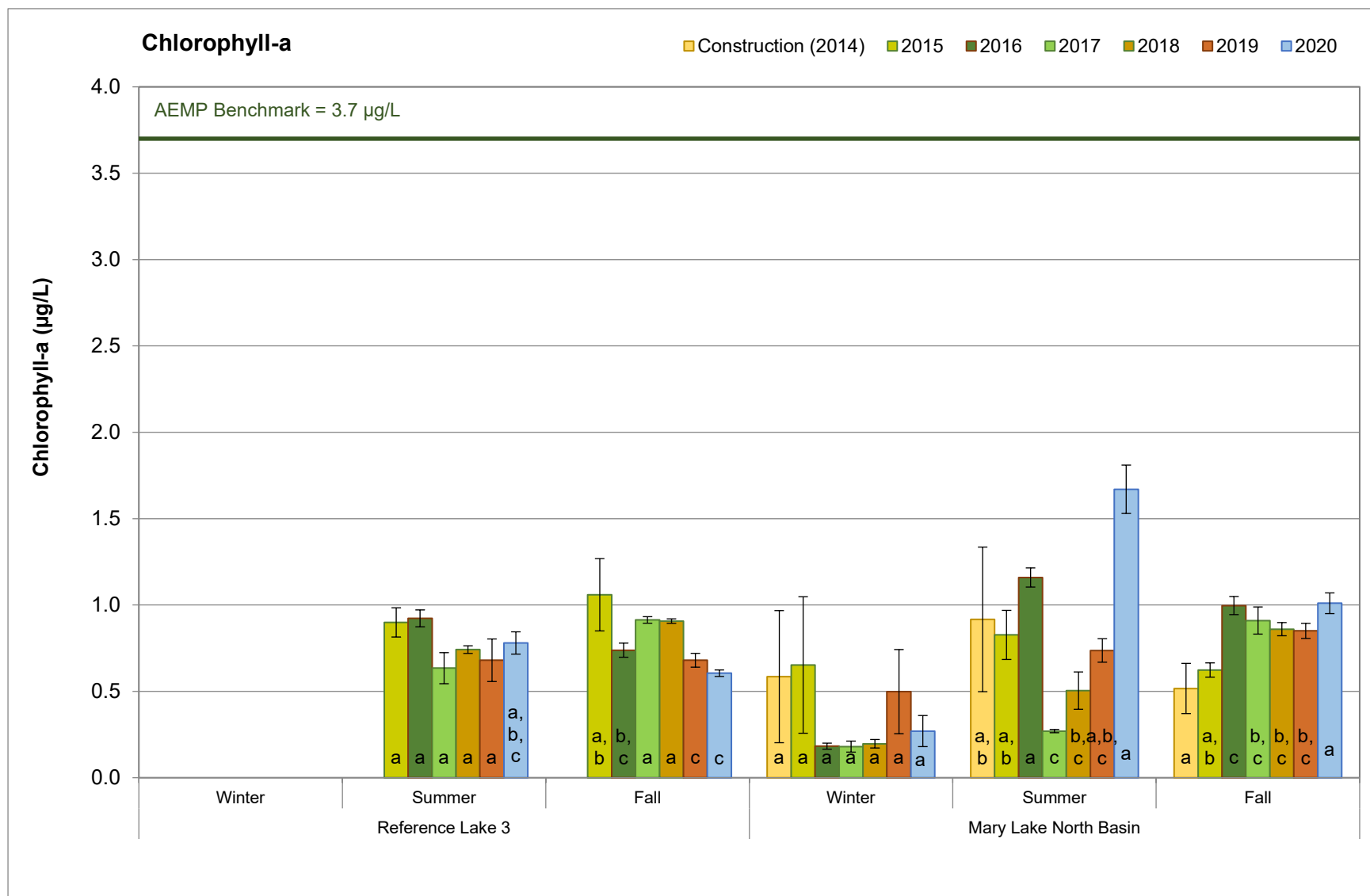


**Figure E.1: Temporal Comparison of Chlorophyll-a Concentrations Among Seasons between the Mary Lake North Basin and Reference Lake 3 for Mine Construction (2014) and Operational (2015 to 2020) Periods (mean ± SE)**

Note: Bars with the same letter at the base do not differ significantly between years for the applicable season.

**APPENDIX F**

**BENTHIC INVERTEBRATE COMMUNITY  
DATA**

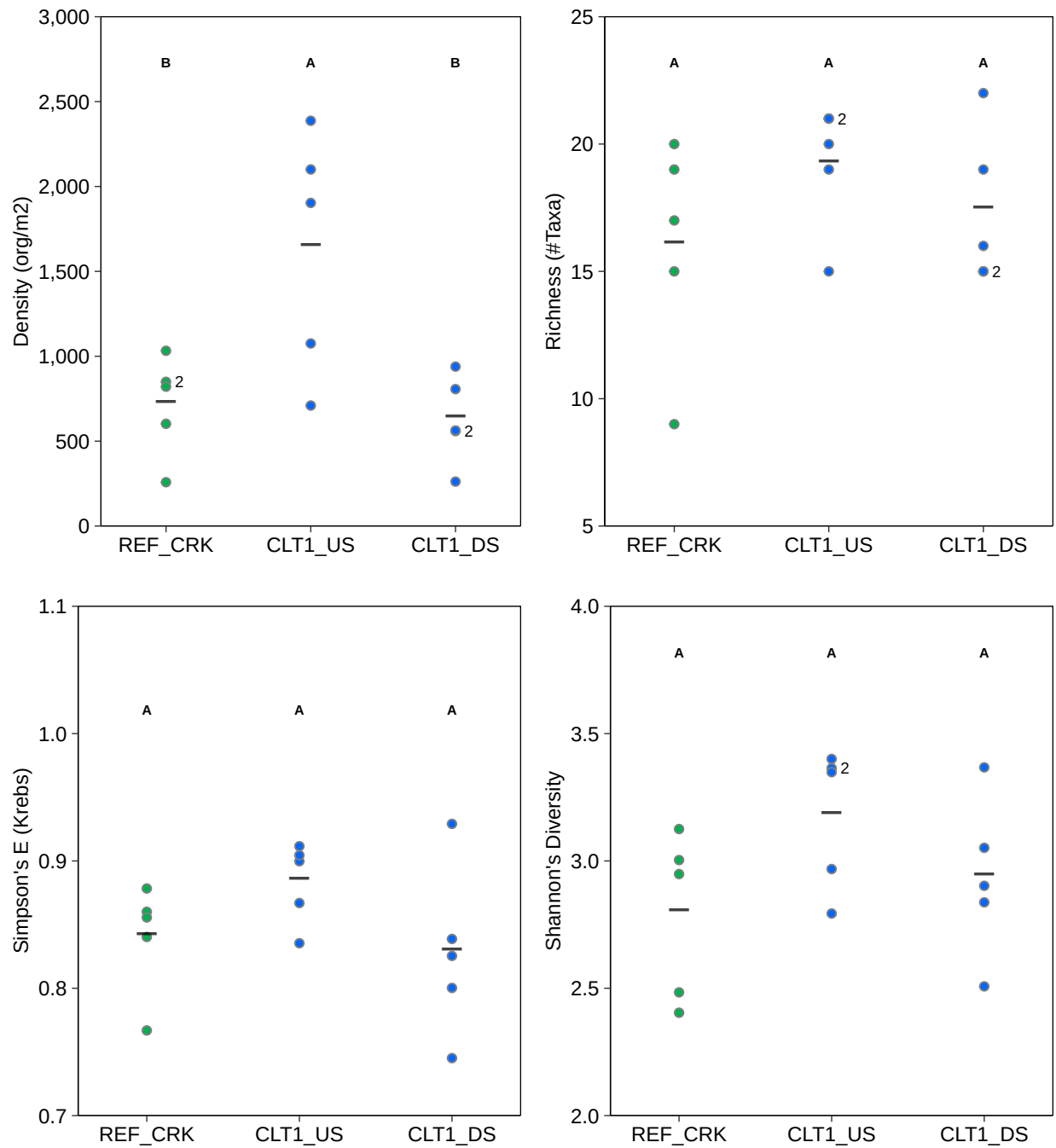


**Figure F.1: Benthic Invertebrate Community Endpoint Comparisons for Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

Notes: Areas that share a letter are not significant ( $P$ -value=0.1). Bars indicate measures of central tendency. Numbers indicate the number of overlapping points.

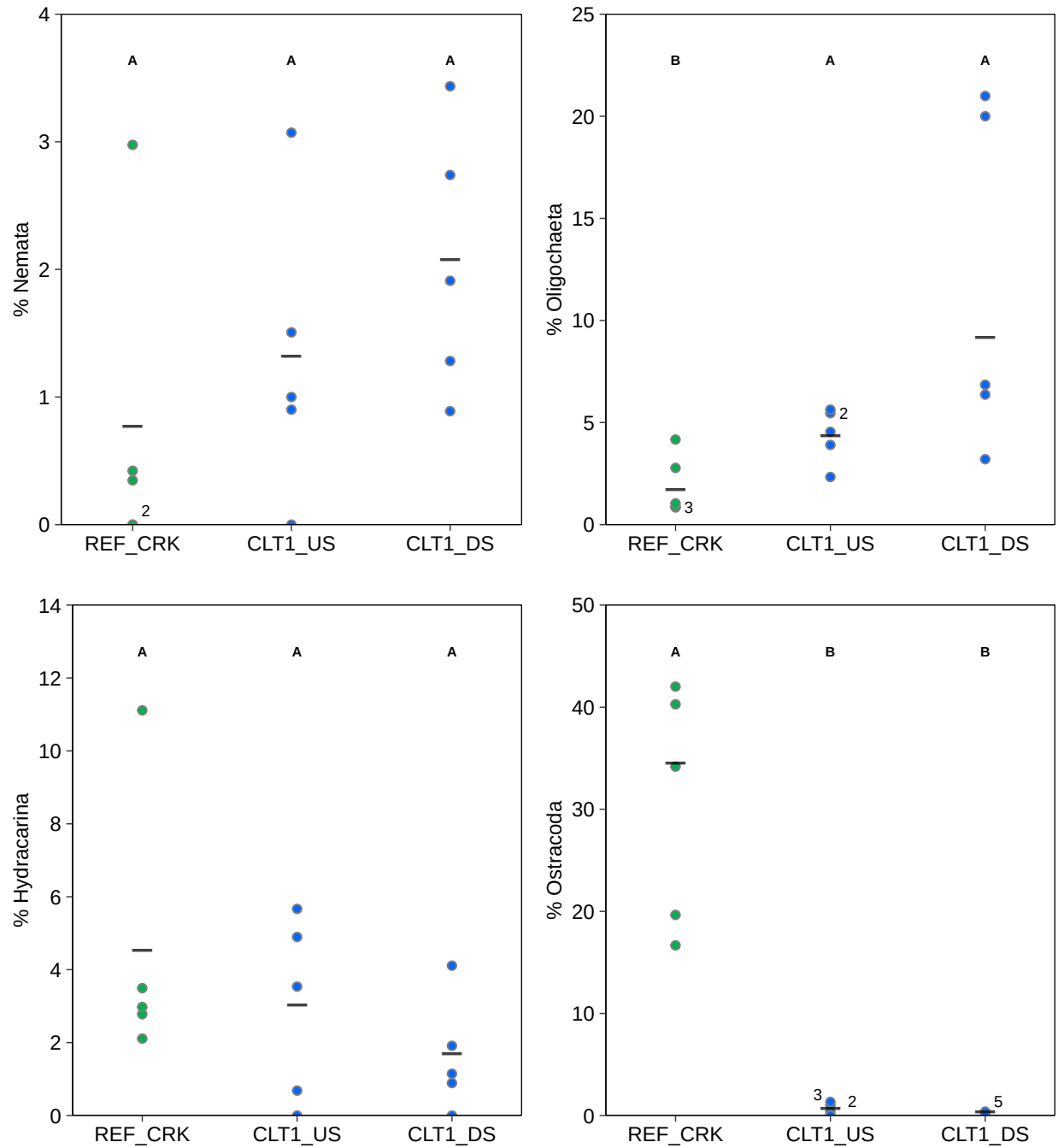


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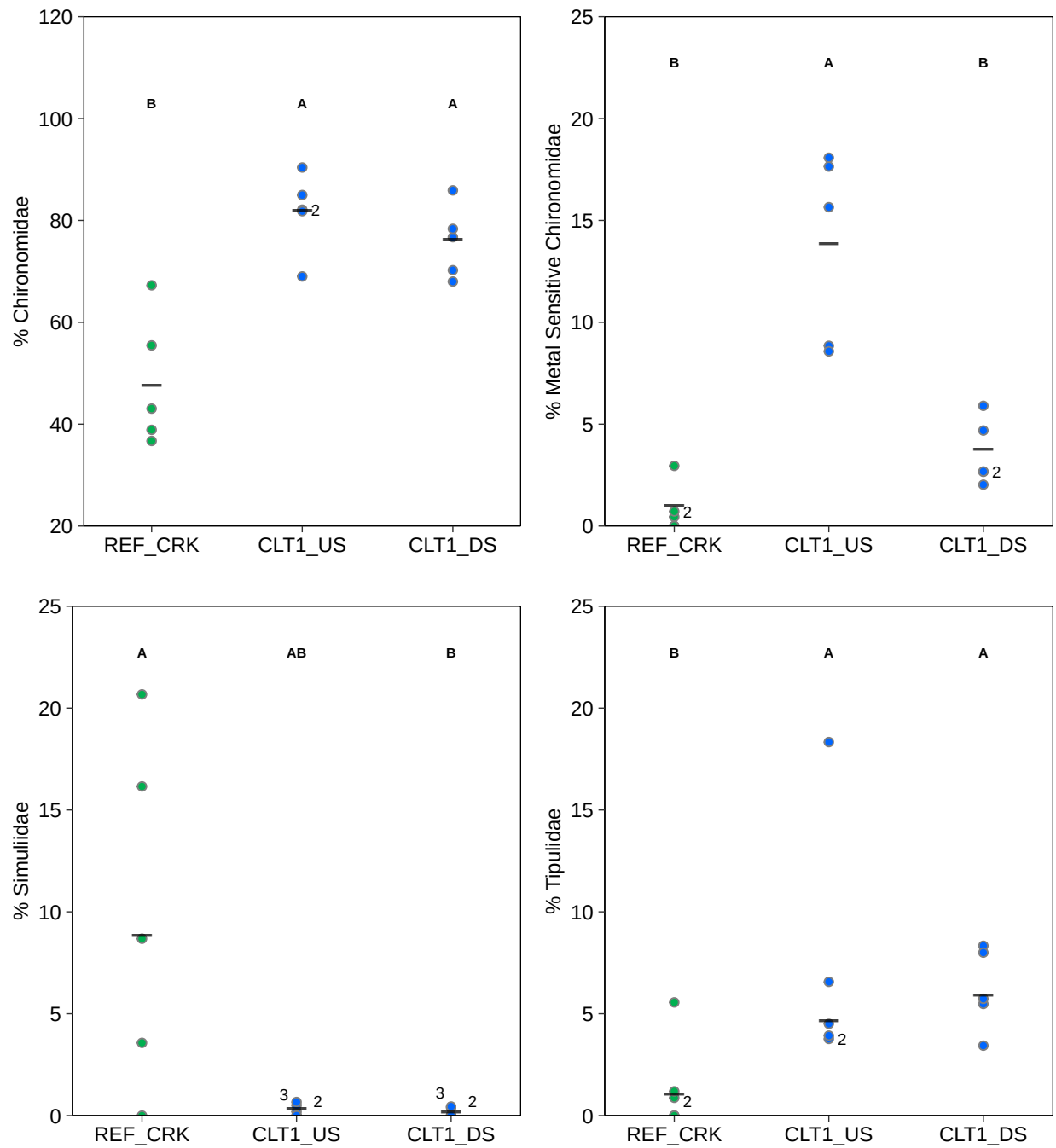


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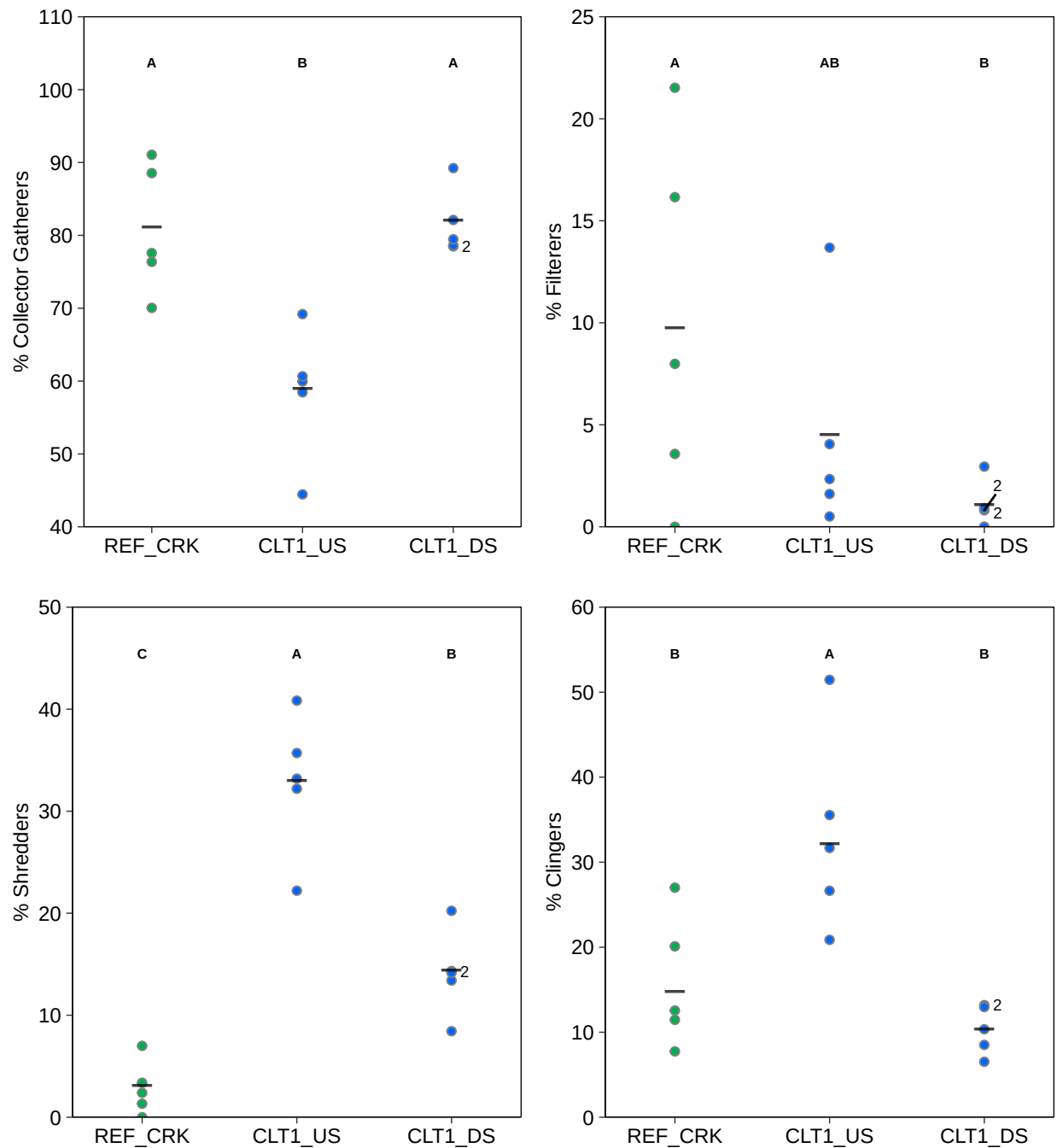


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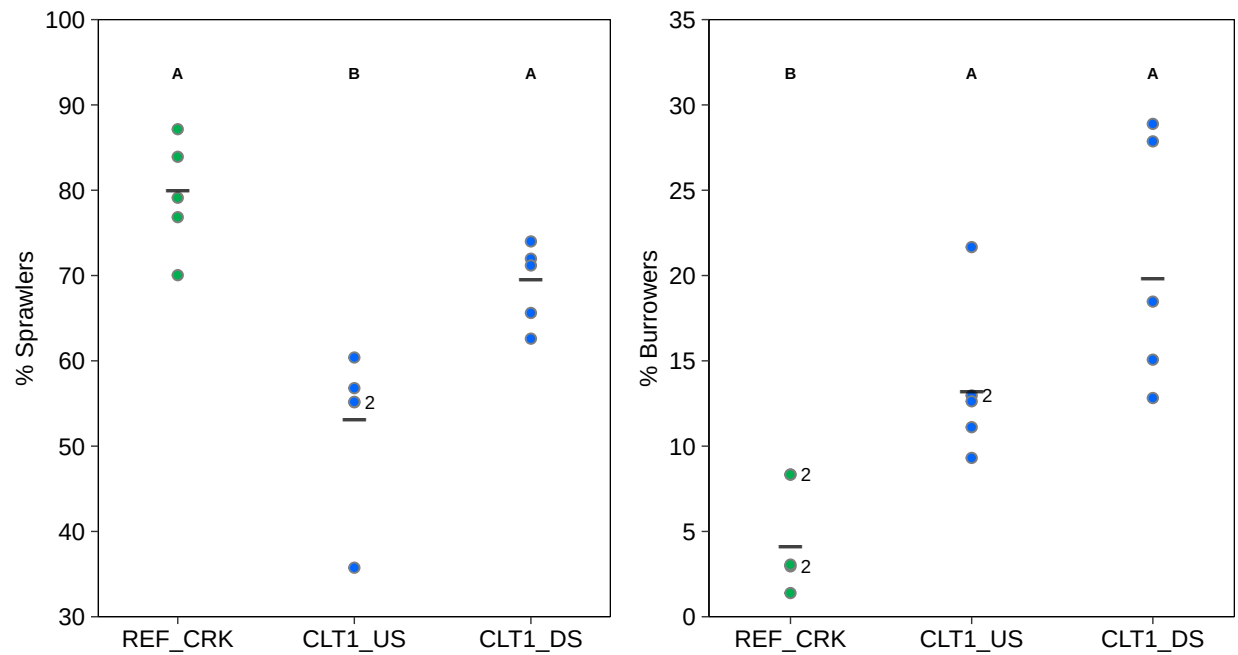


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Notes: Areas that share a letter are not significant ( $P$ -value=0.1). Bars indicate measures of central tendency. Numbers indicate the number of overlapping points.



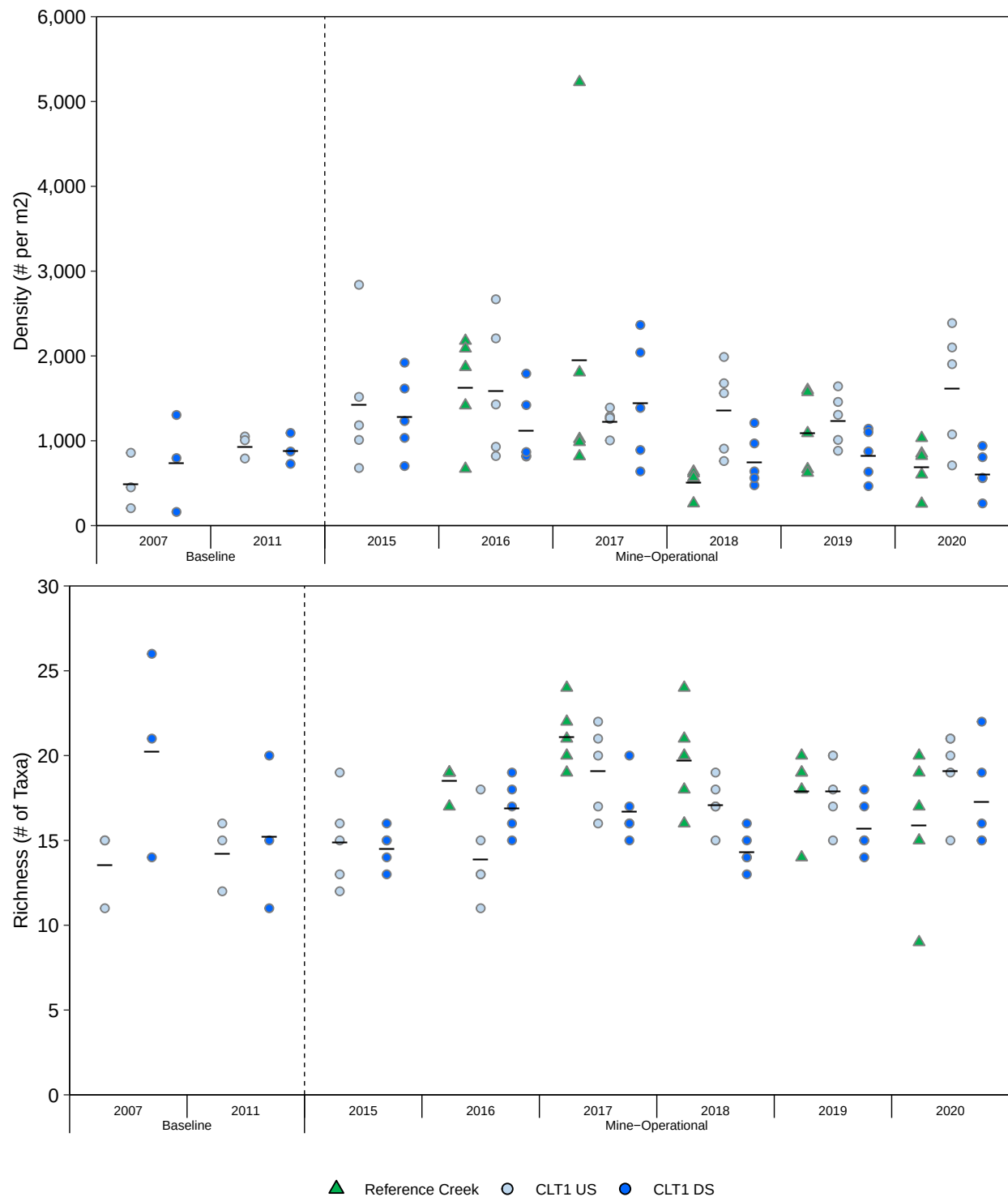


**Figure F.2: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake Tributary 1 Upstream (CLT1 US) and Downstream (CLT1 DS) Stations among Mine Baseline (2007 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

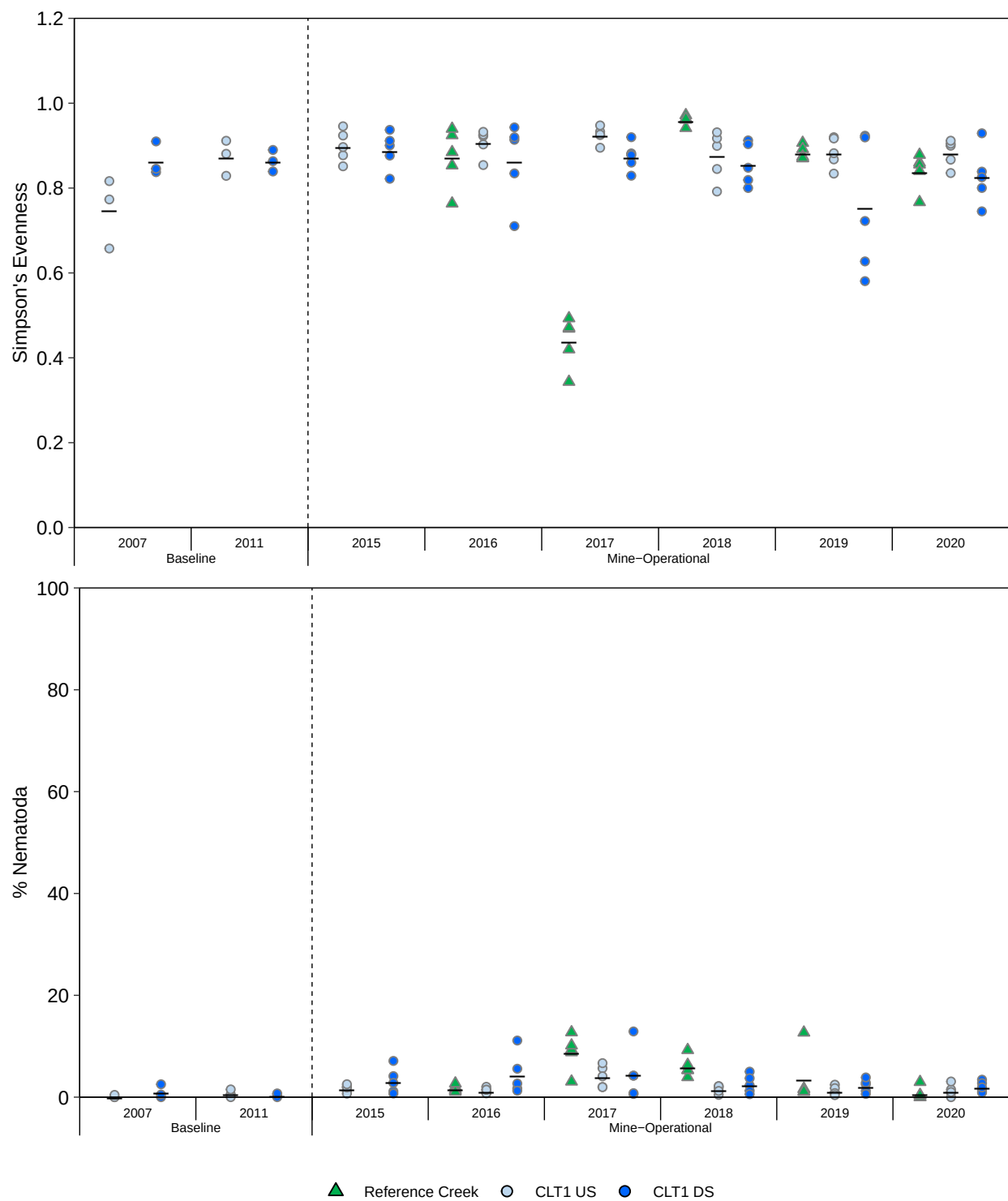


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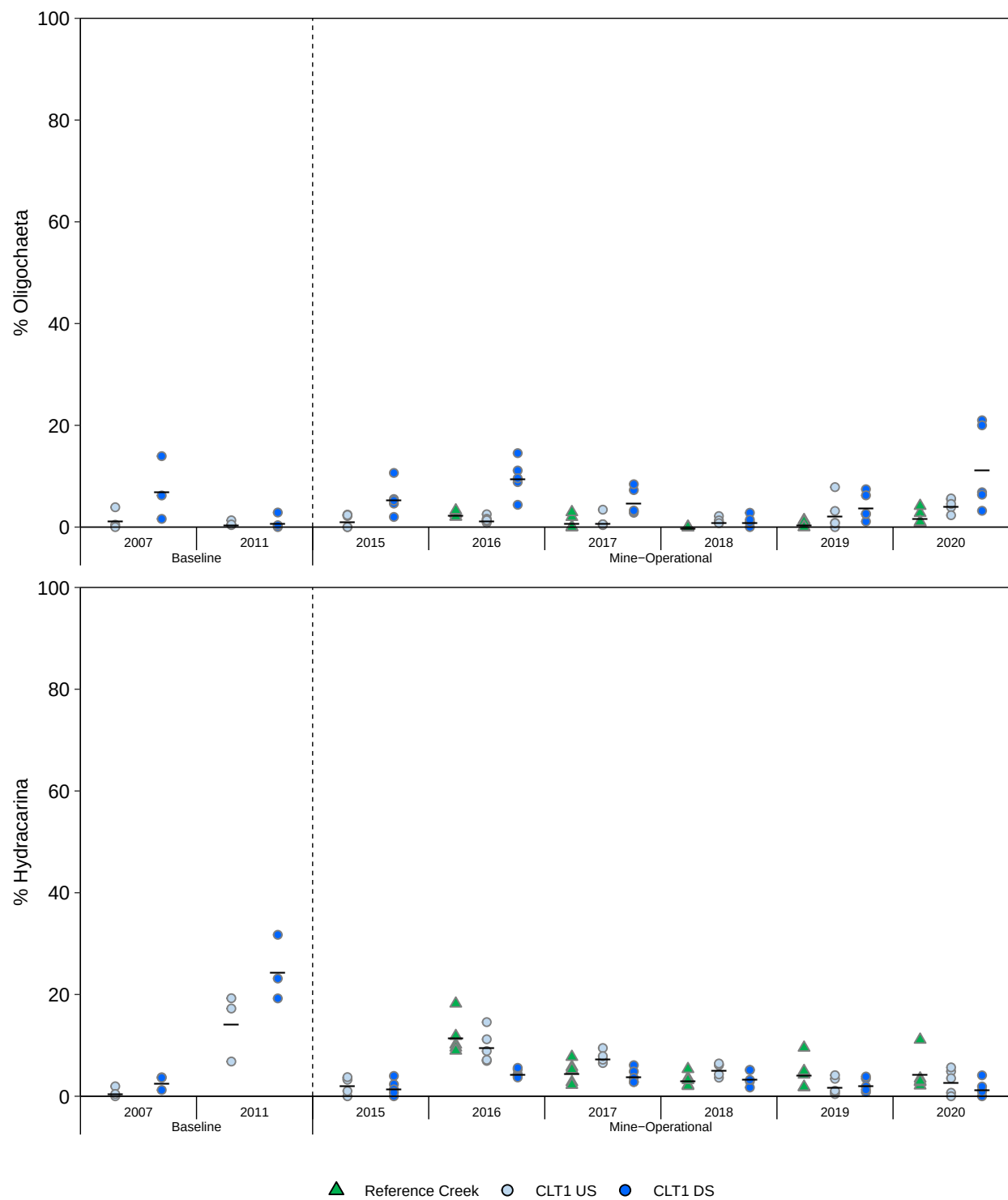


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Note: Black bars indicate average of replicates.

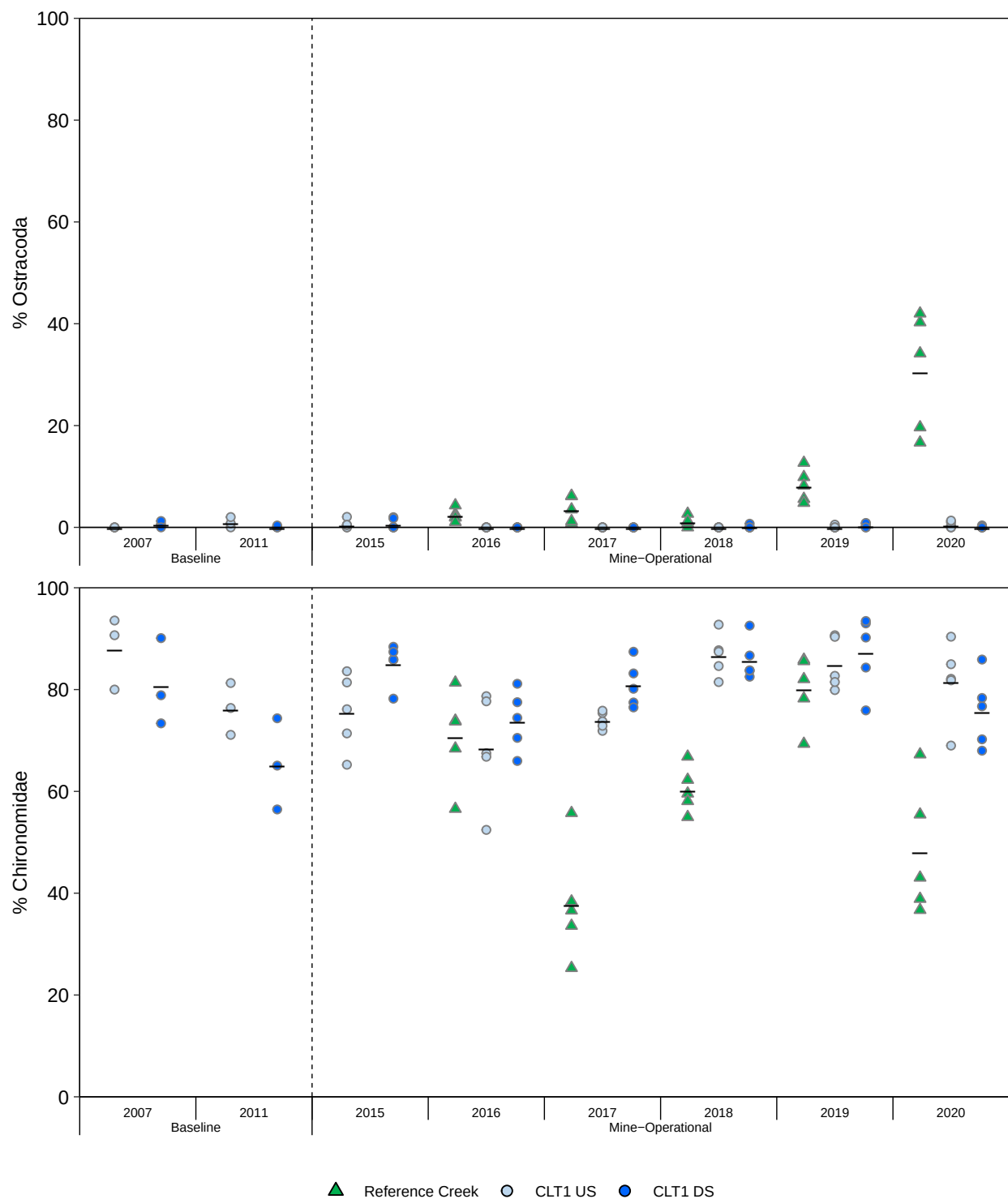


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Note: Black bars indicate average of replicates.

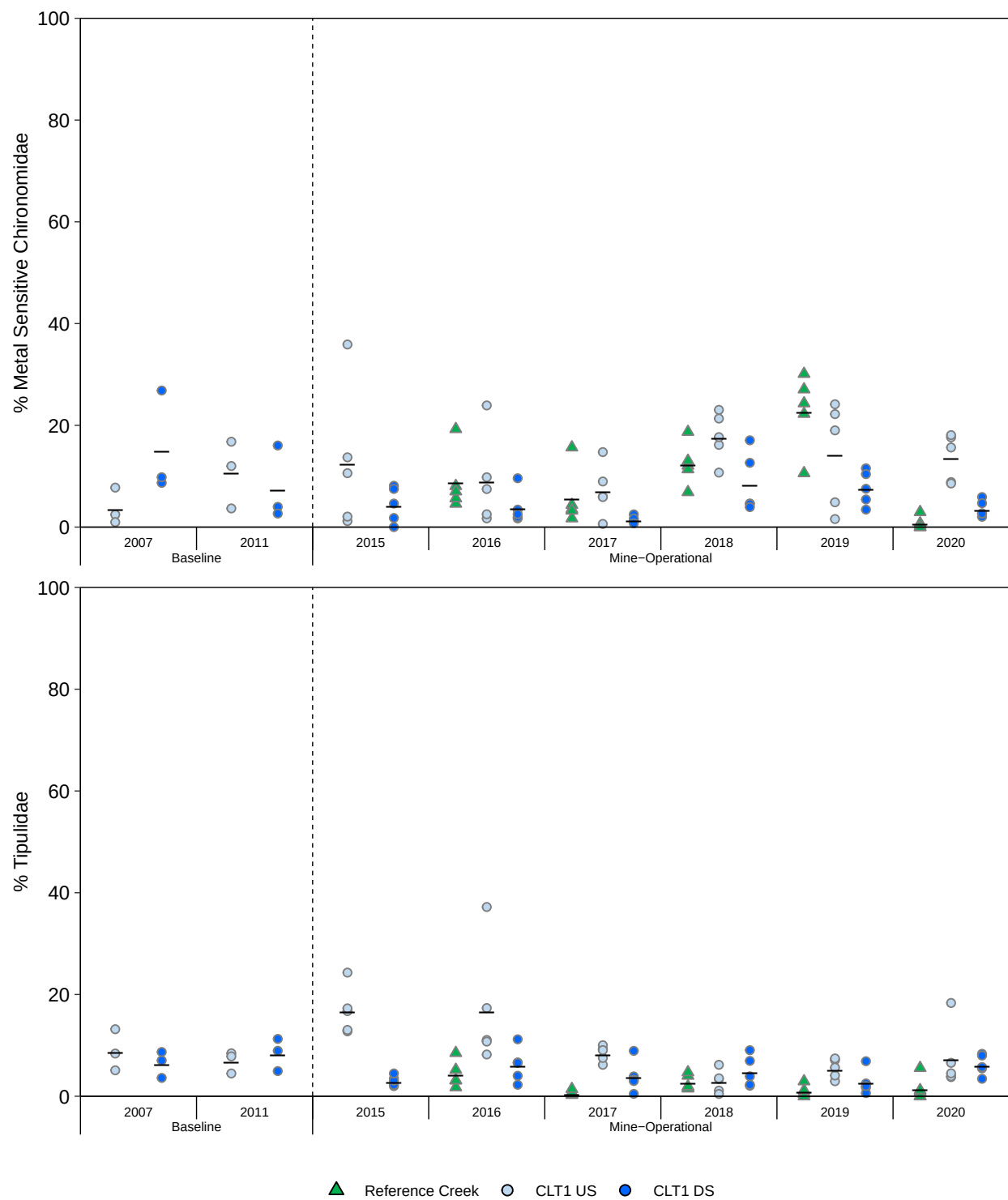


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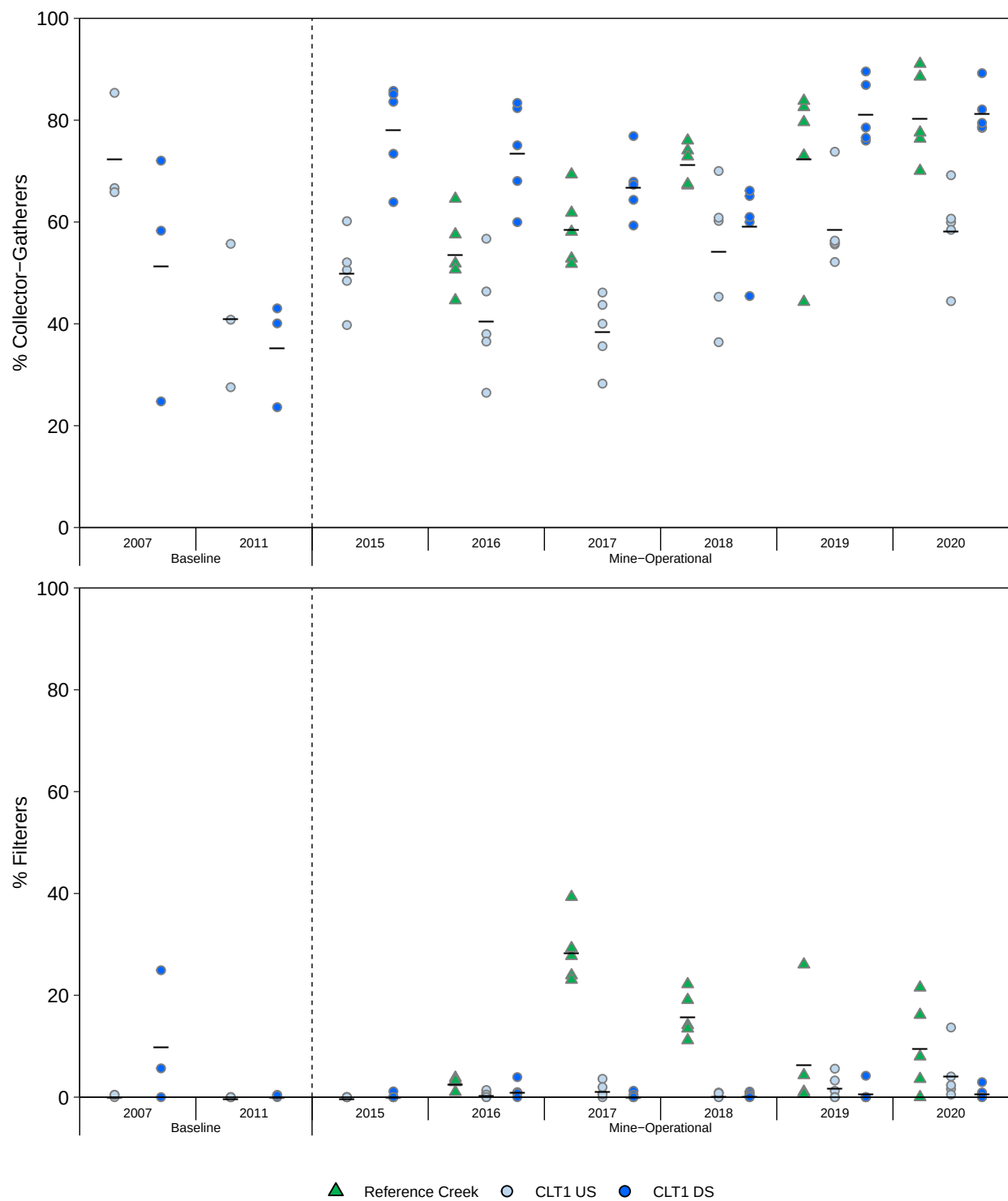


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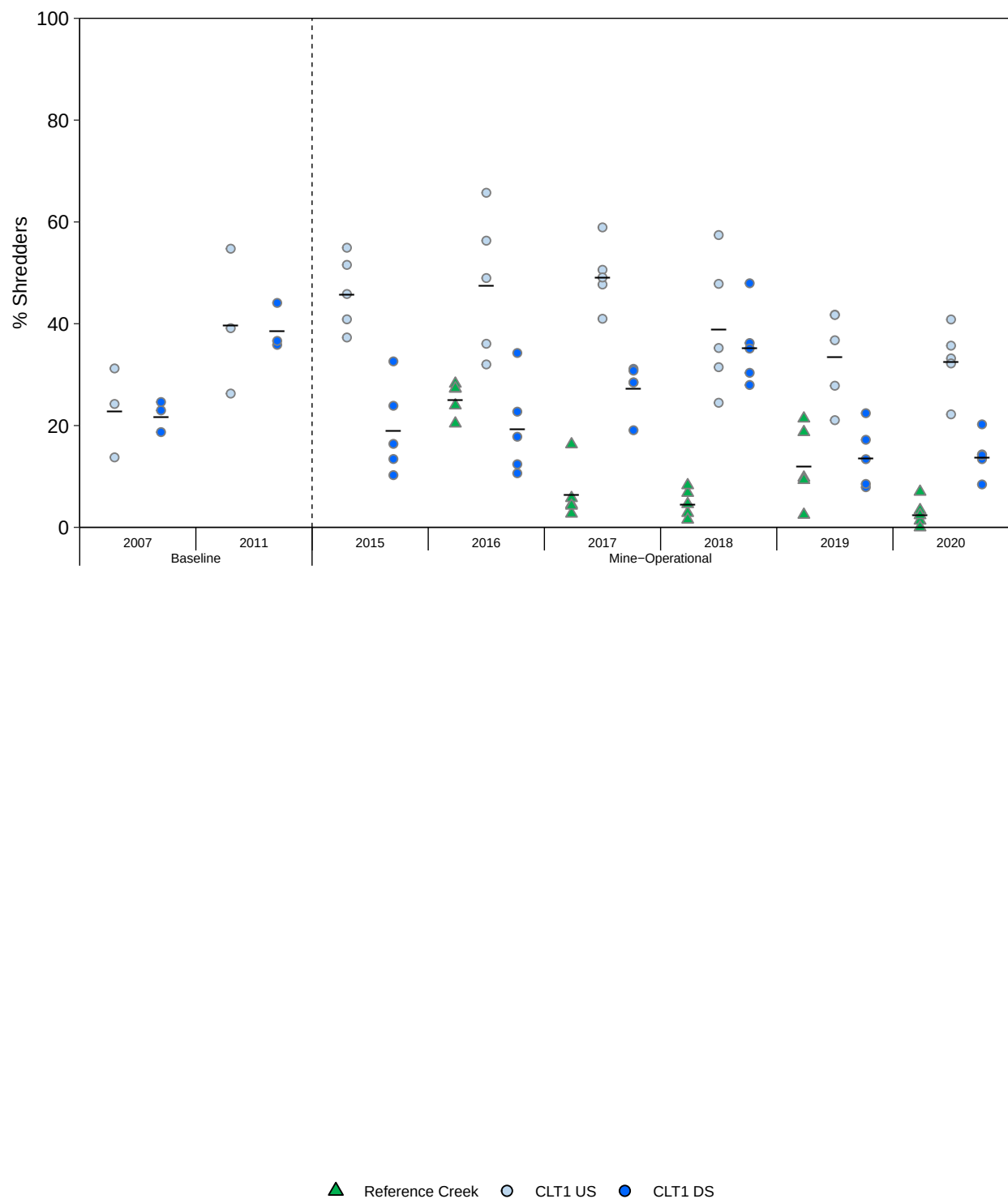


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Note: Black bars indicate average of replicates.

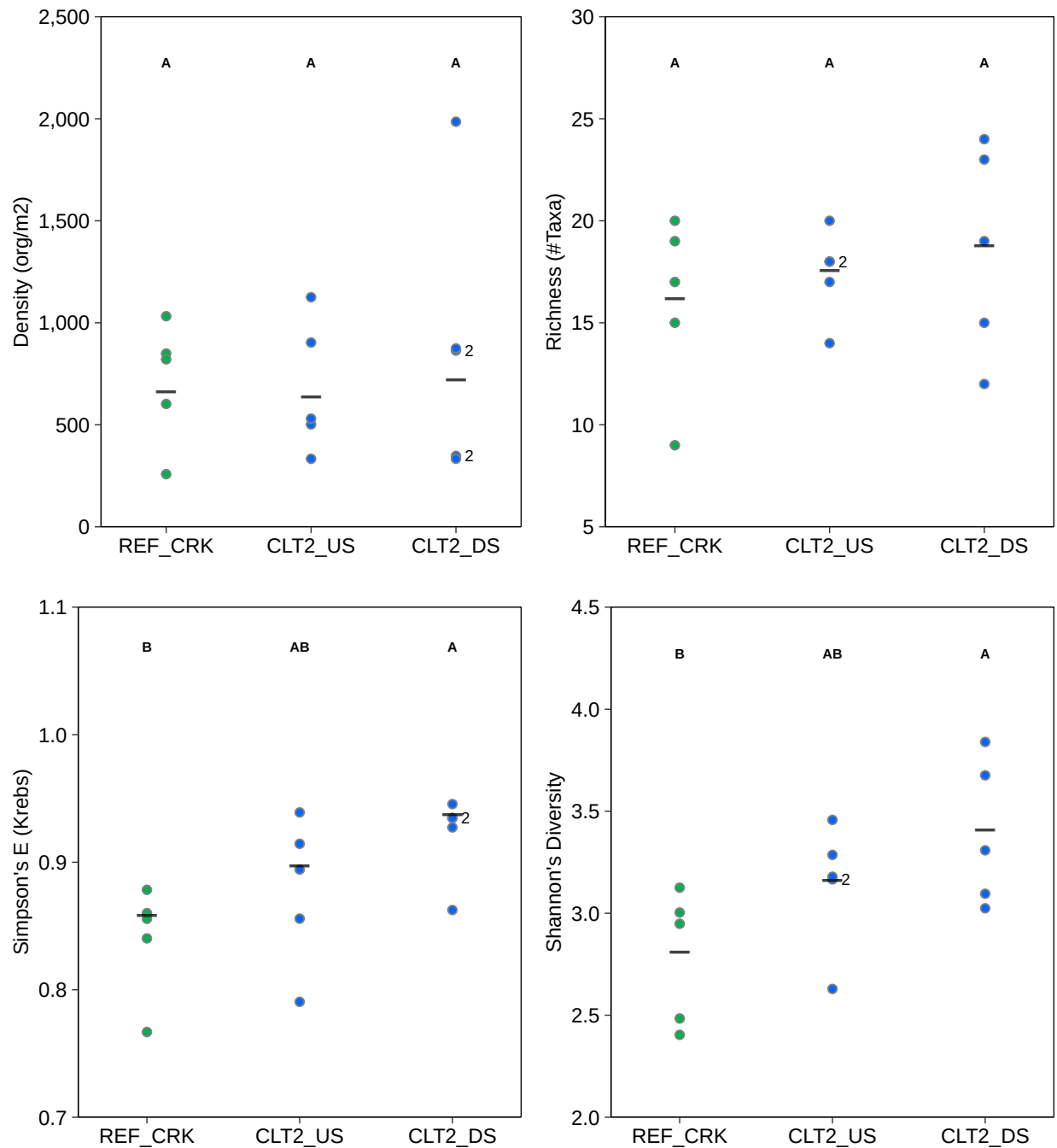


**Figure F.3: Benthic Invertebrate Community Endpoint Comparisons for Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

Notes: Areas that share a letter are not significant (P-value=0.1). Bars indicate measures of central tendency. Numbers indicate the number of overlapping points.



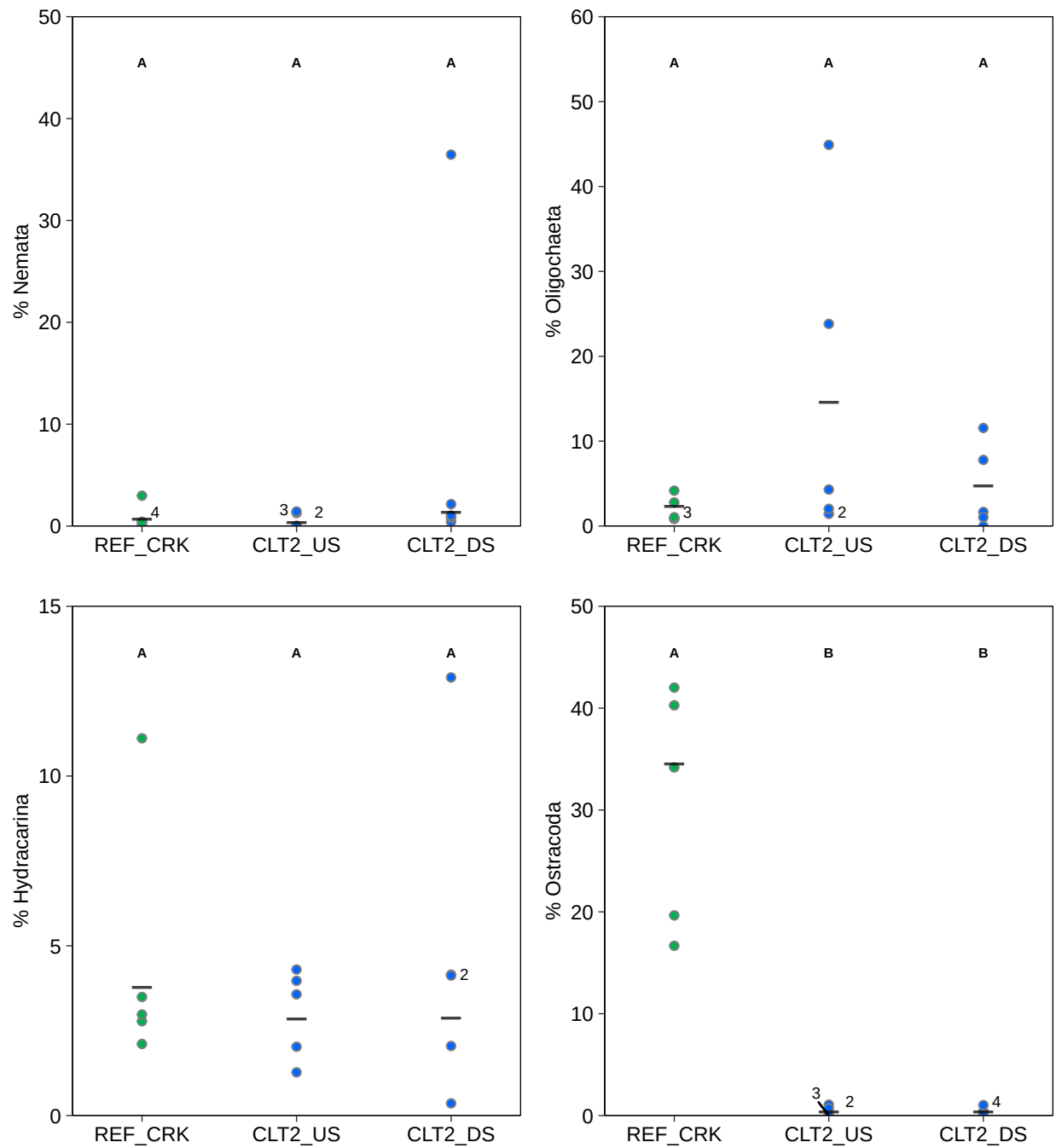


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Notes: Areas that share a letter are not significant ( $P$ -value=0.1). Bars indicate measures of central tendency. Numbers indicate the number of overlapping points.

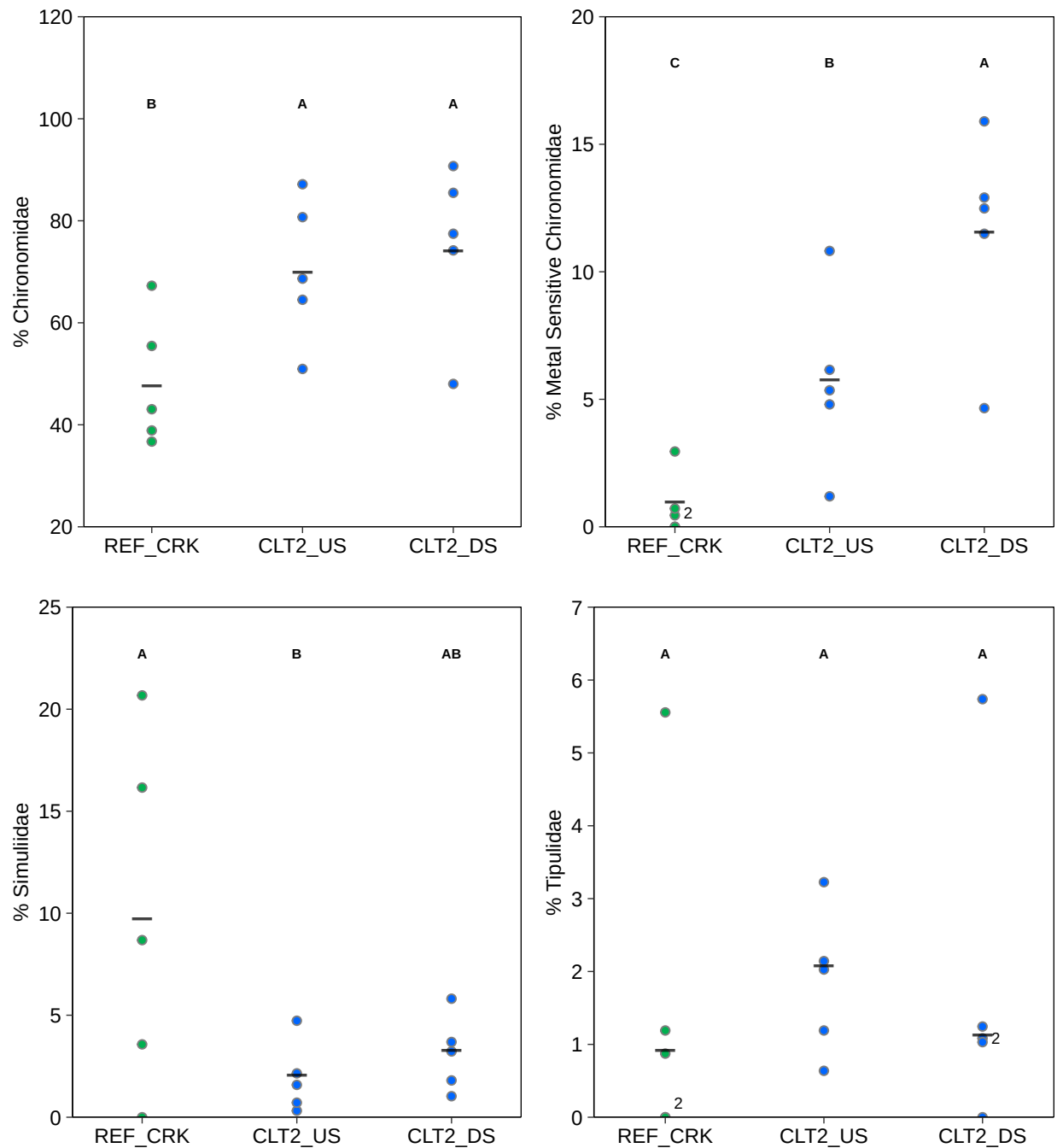


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Notes: Areas that share a letter are not significant ( $P$ -value=0.1). Bars indicate measures of central tendency. Numbers indicate the number of overlapping points.

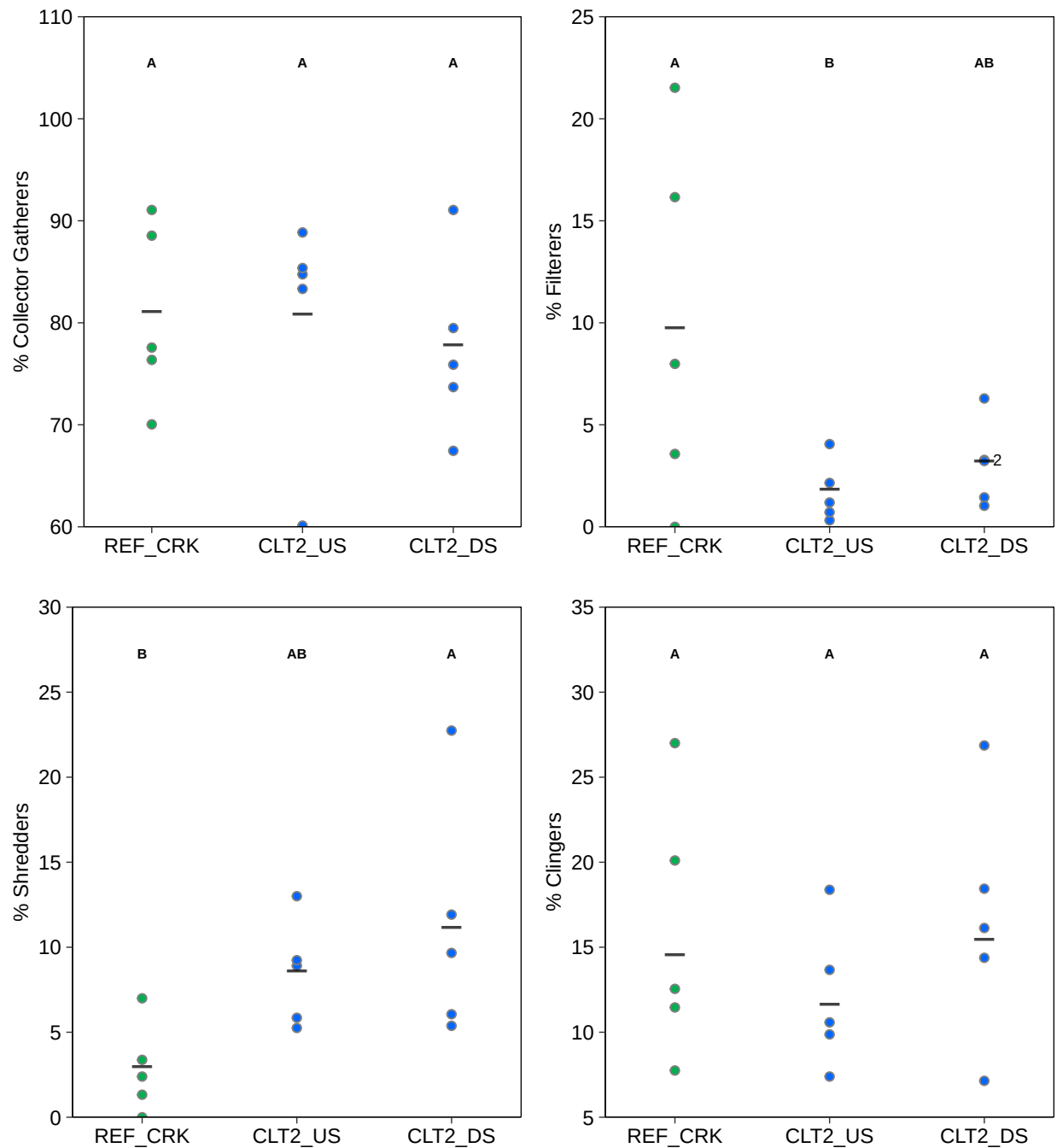


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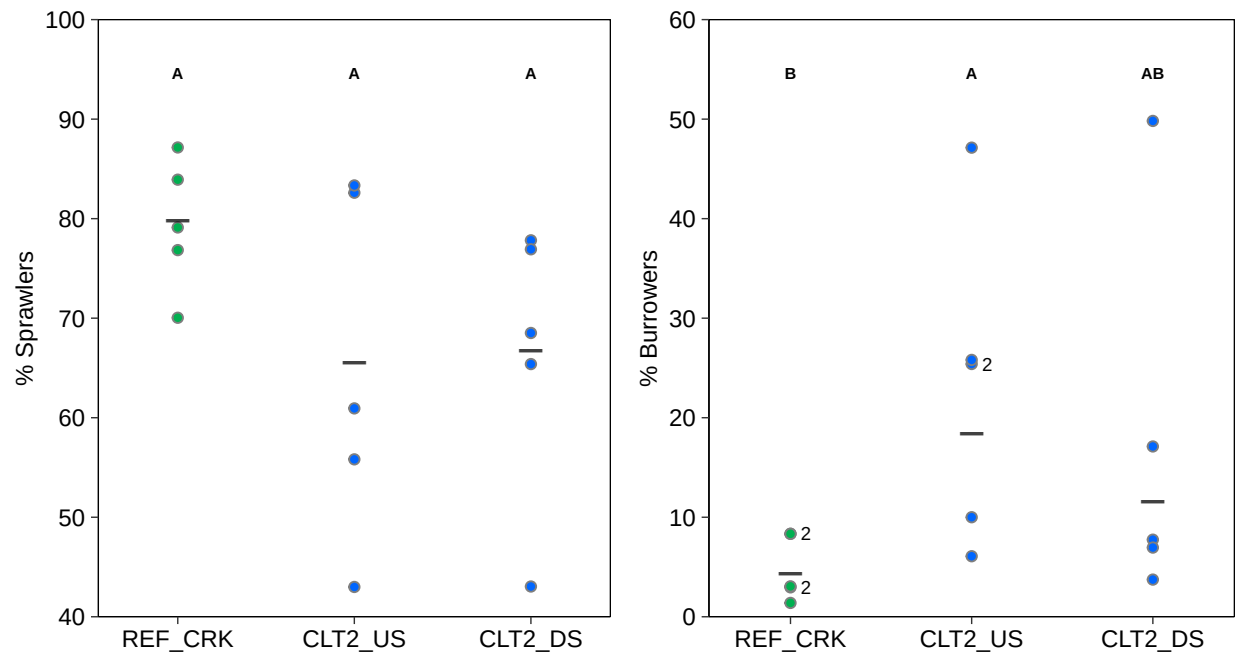


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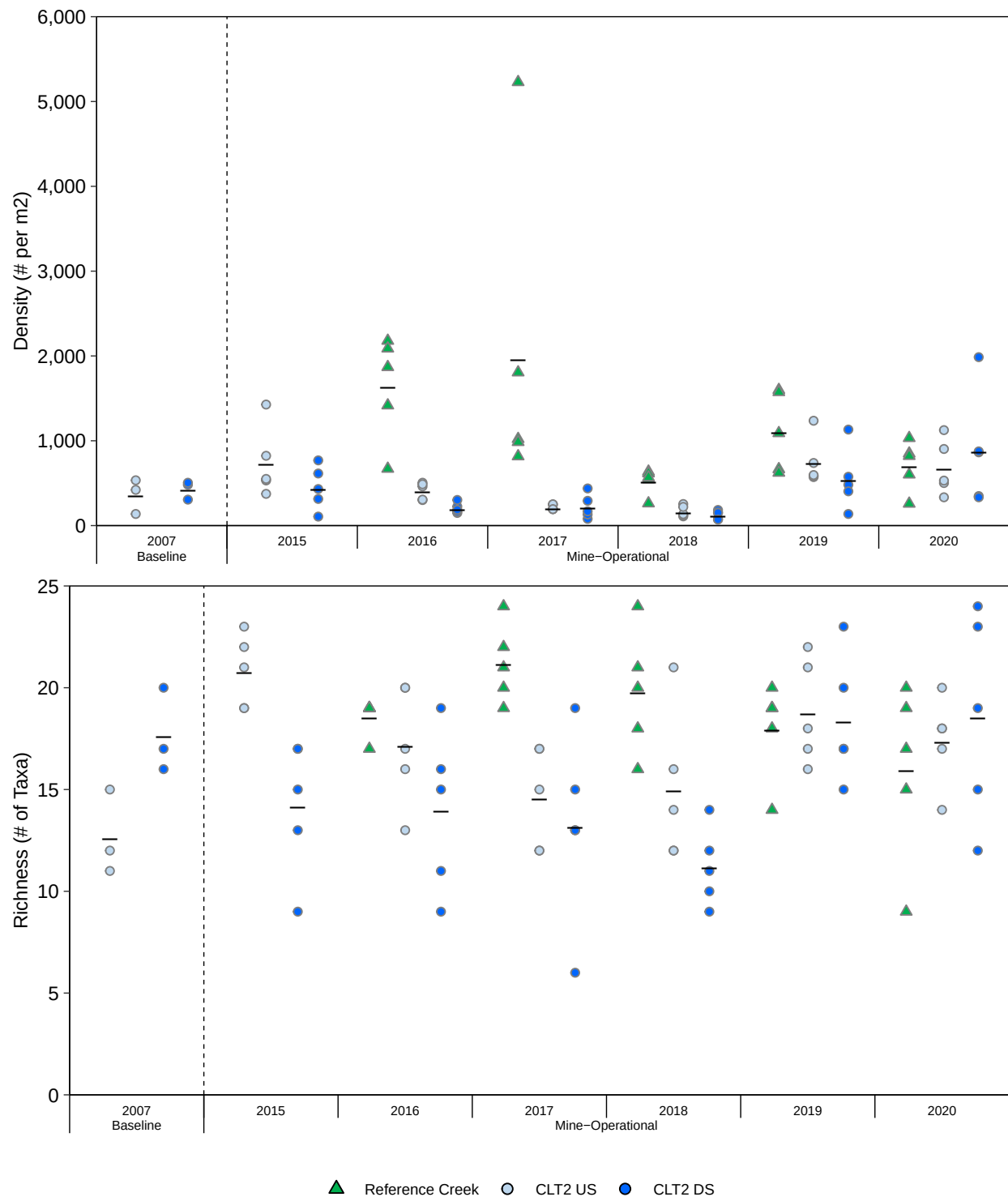


**Figure F.4: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake Tributary 2 Upstream (CLT2 US) and Downstream (CLT2 DS) Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

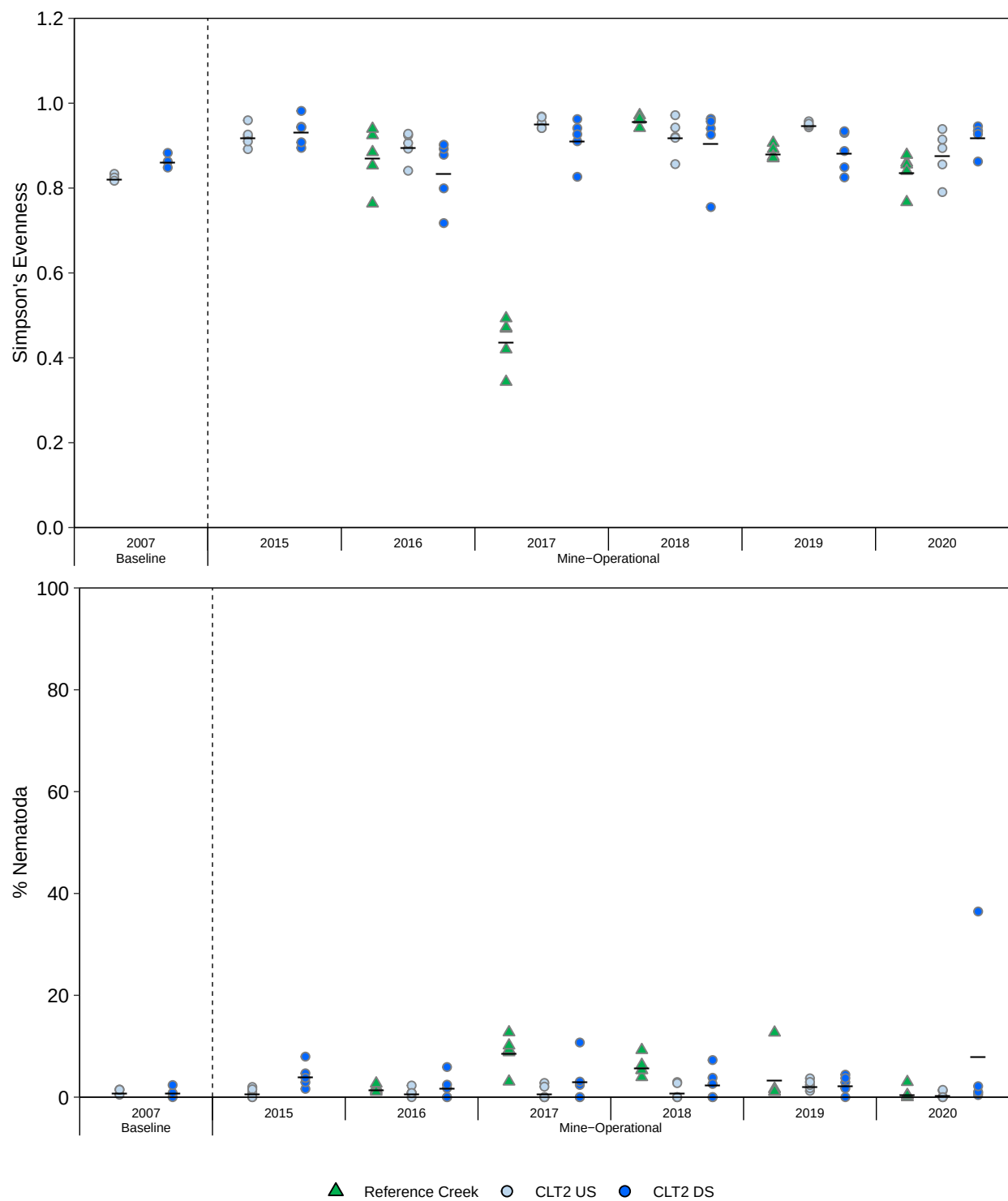


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Note: Black bars indicate average of replicates.

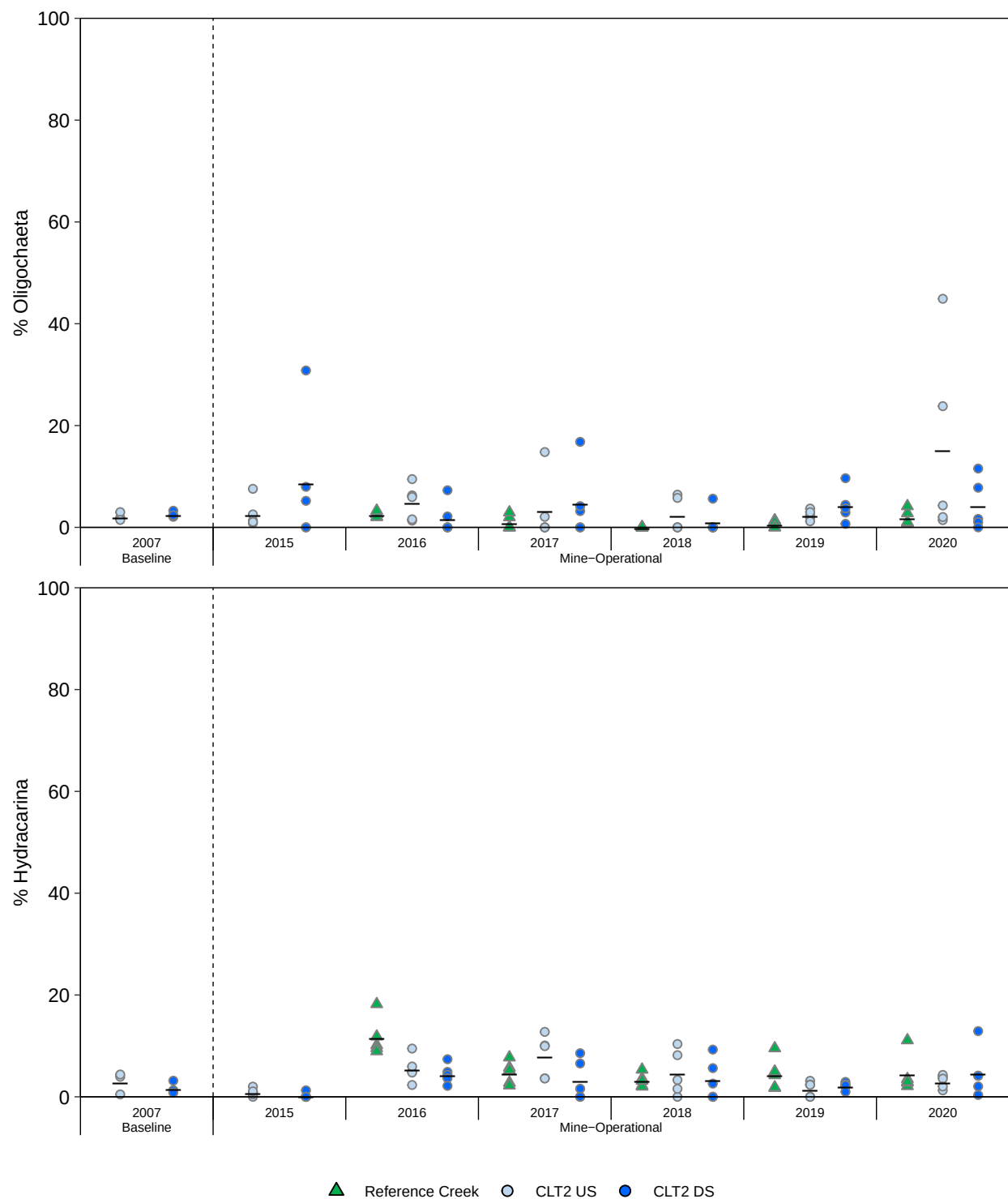


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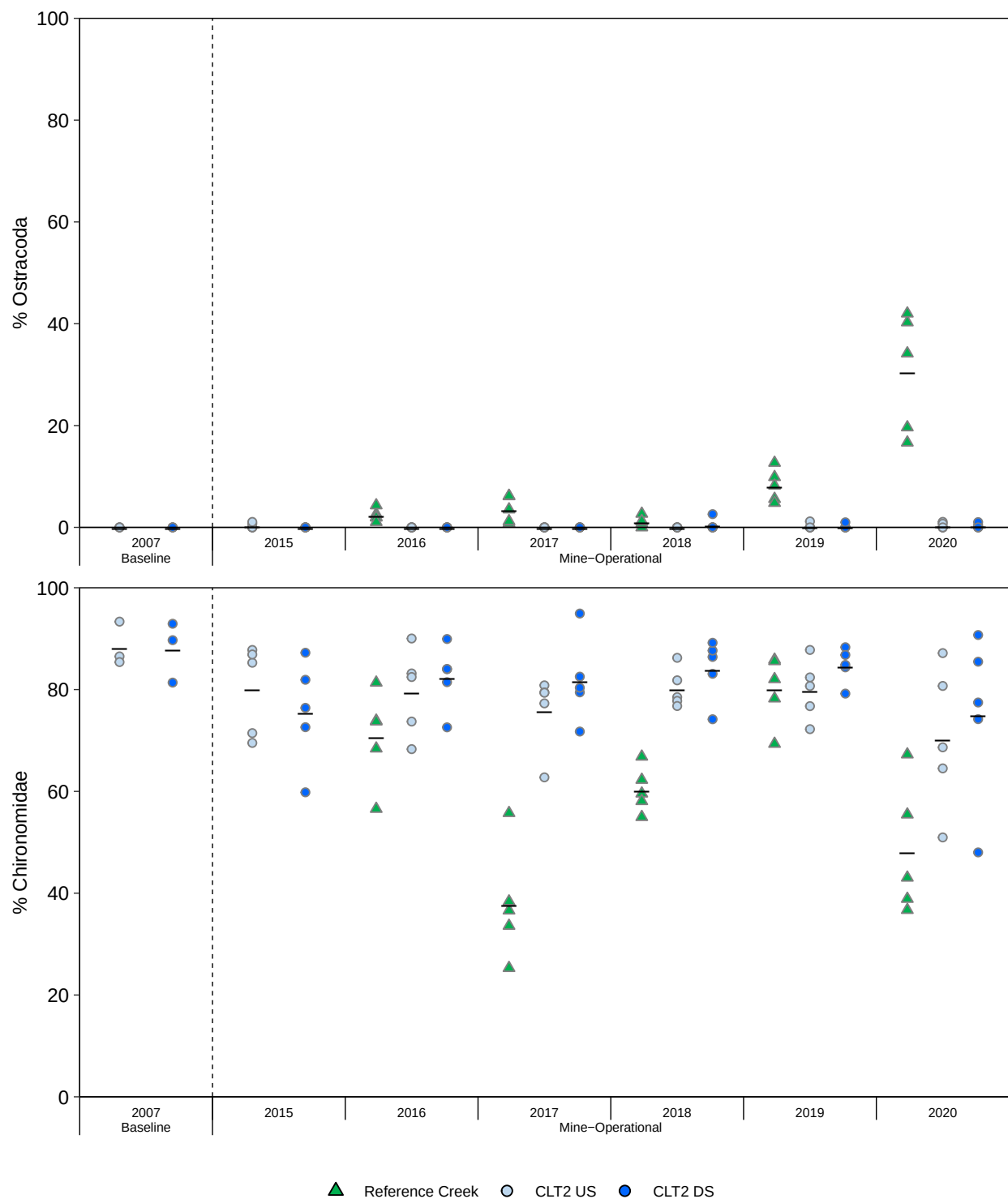


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Note: Black bars indicate average of replicates.



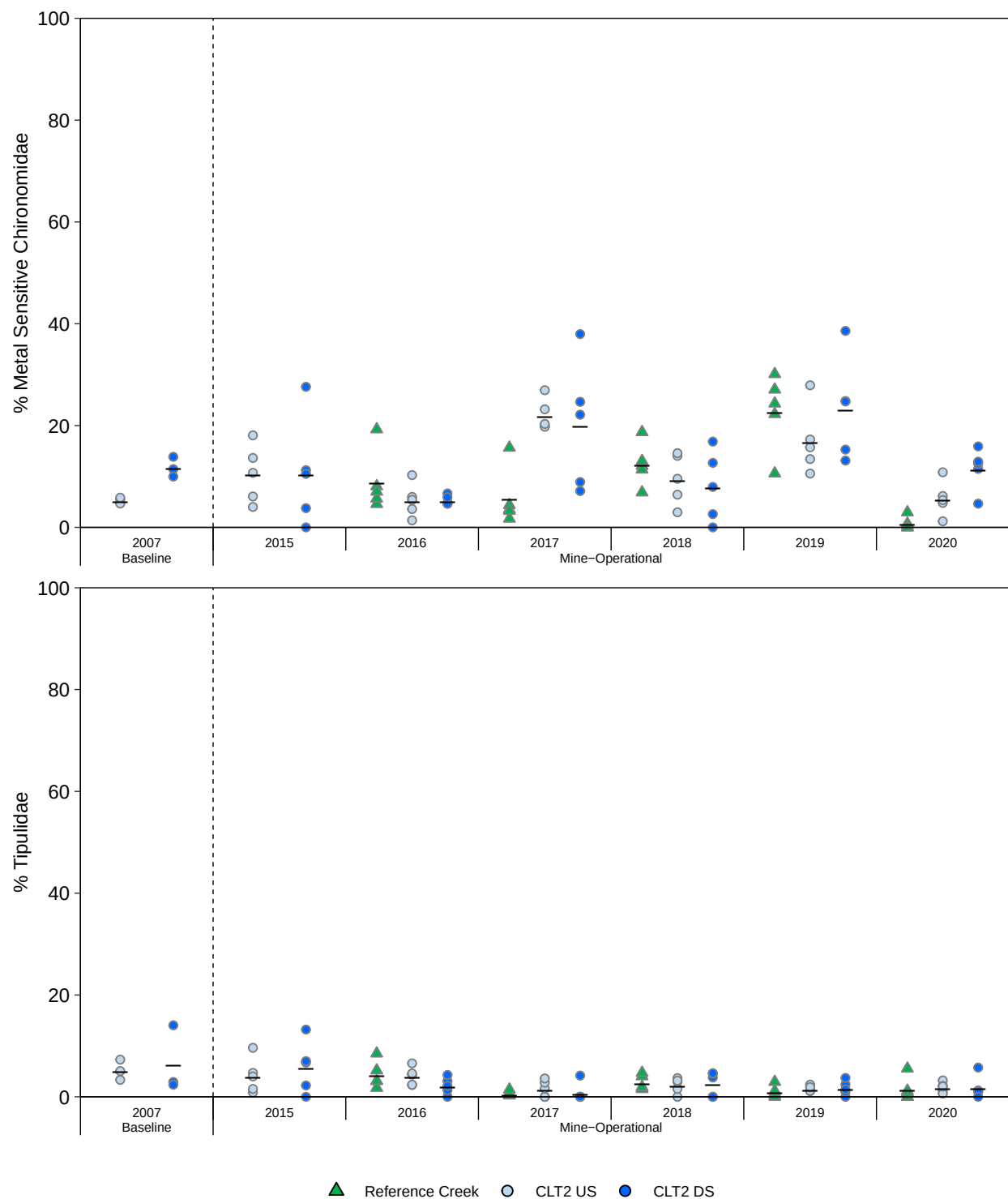


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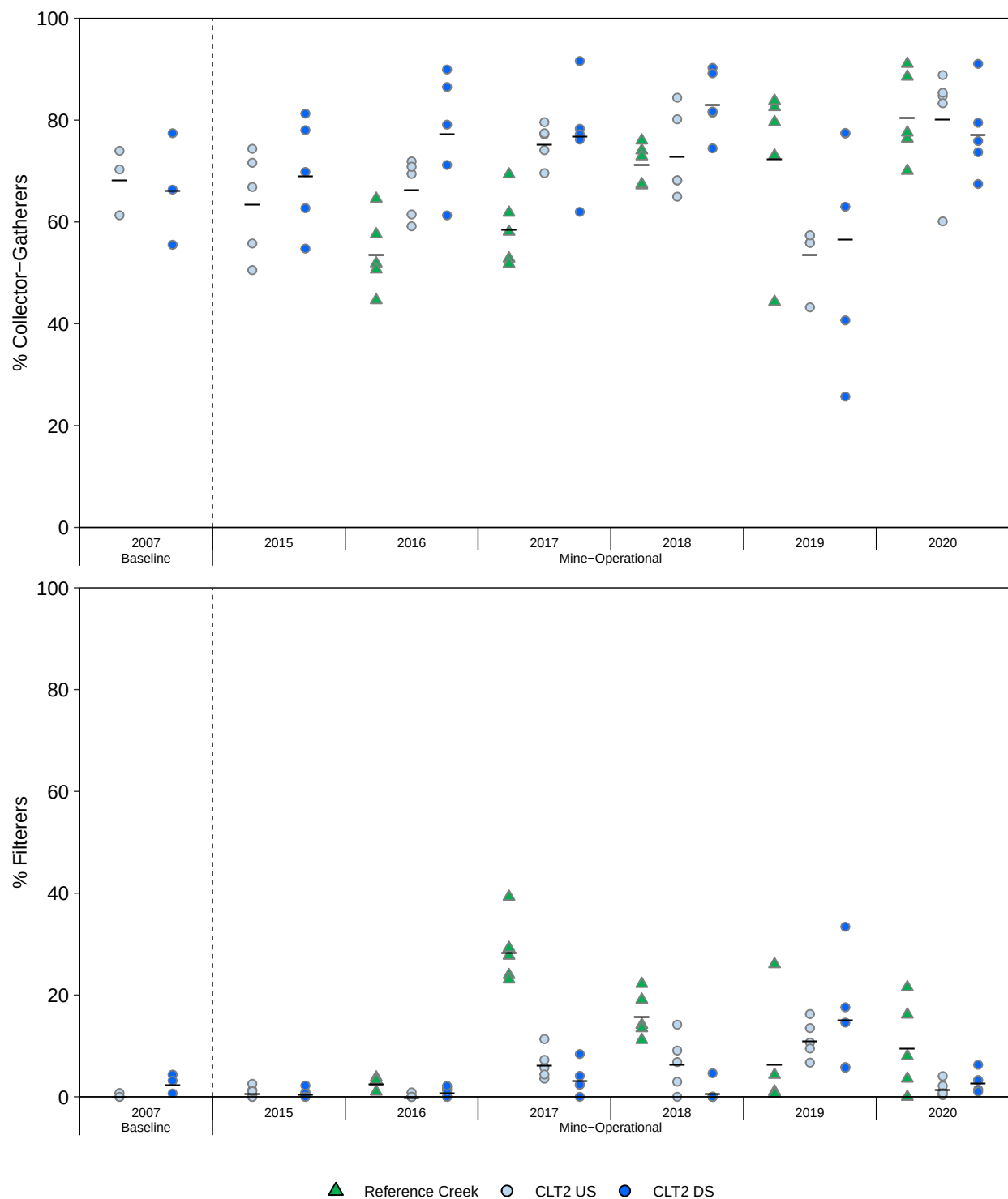


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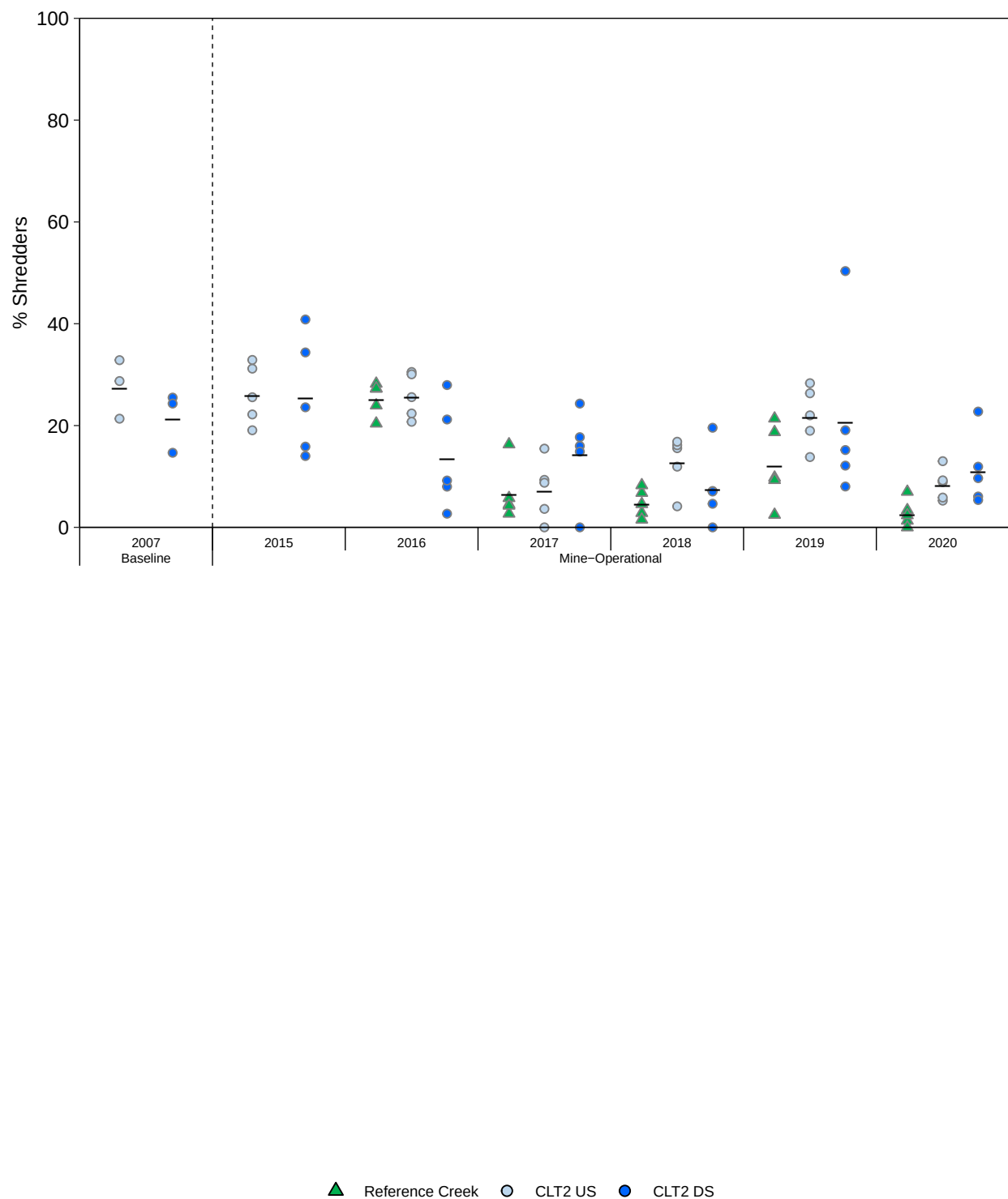


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Note: Black bars indicate average of replicates.

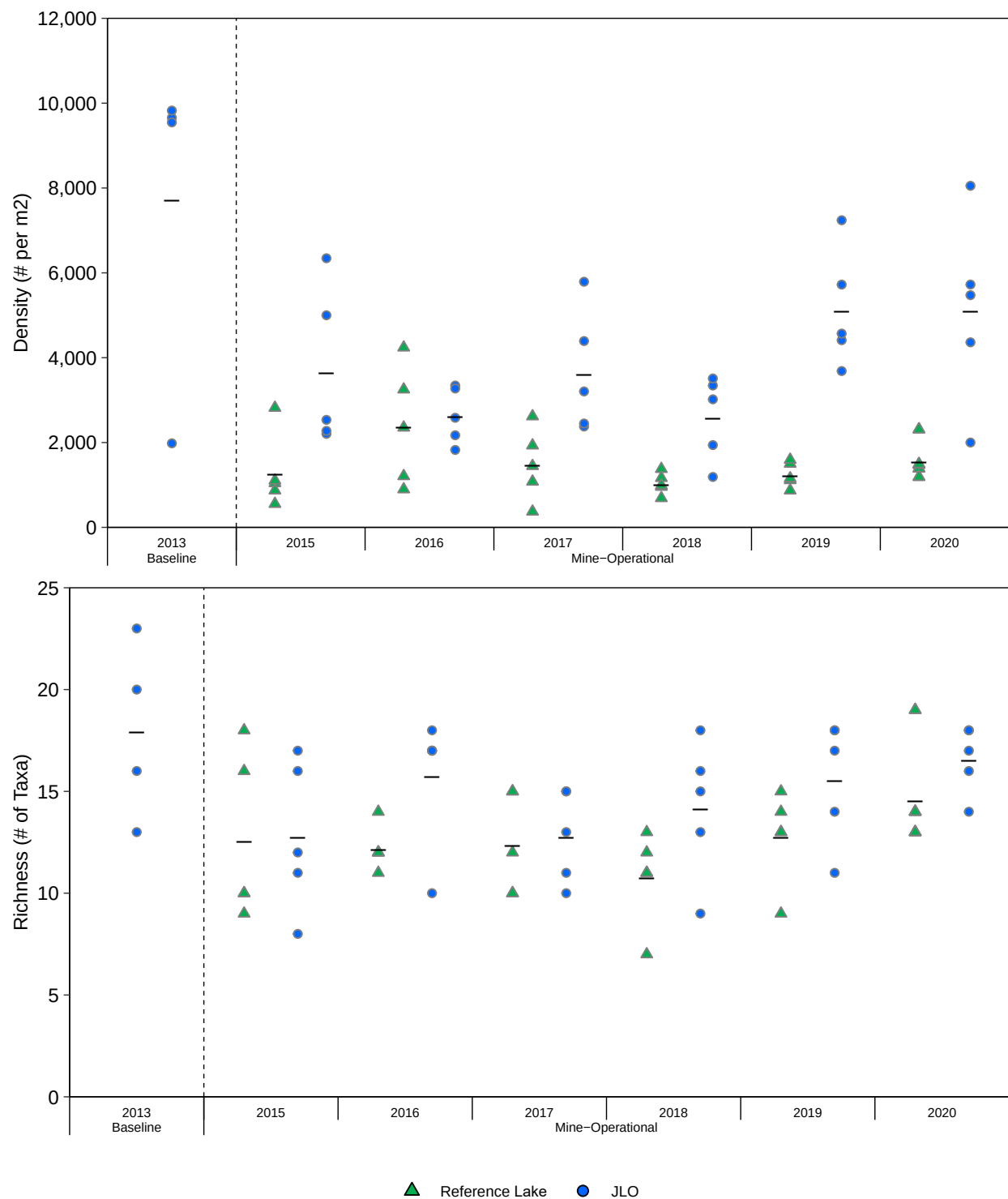


**Figure F.5: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

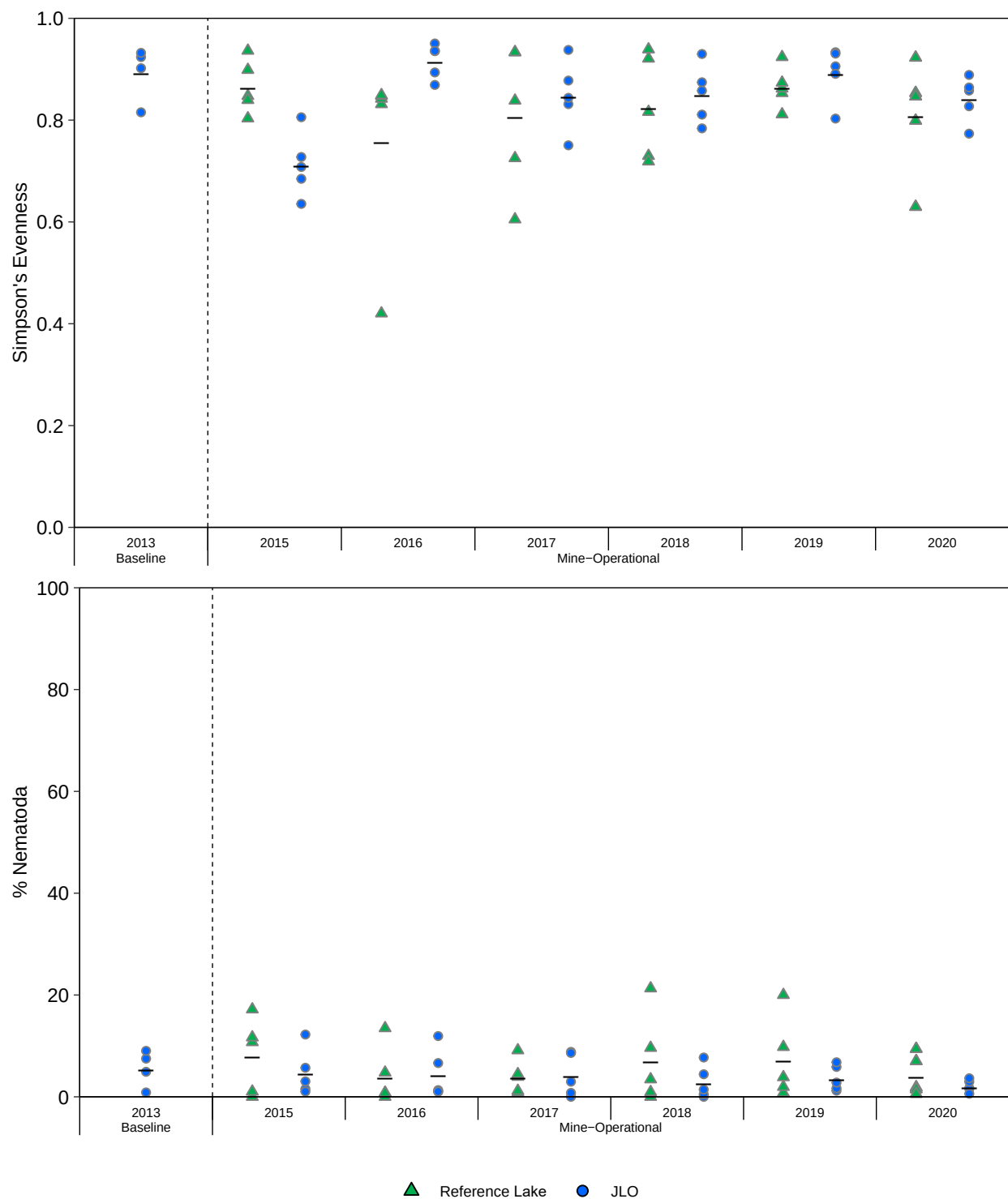


**Figure F.5: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

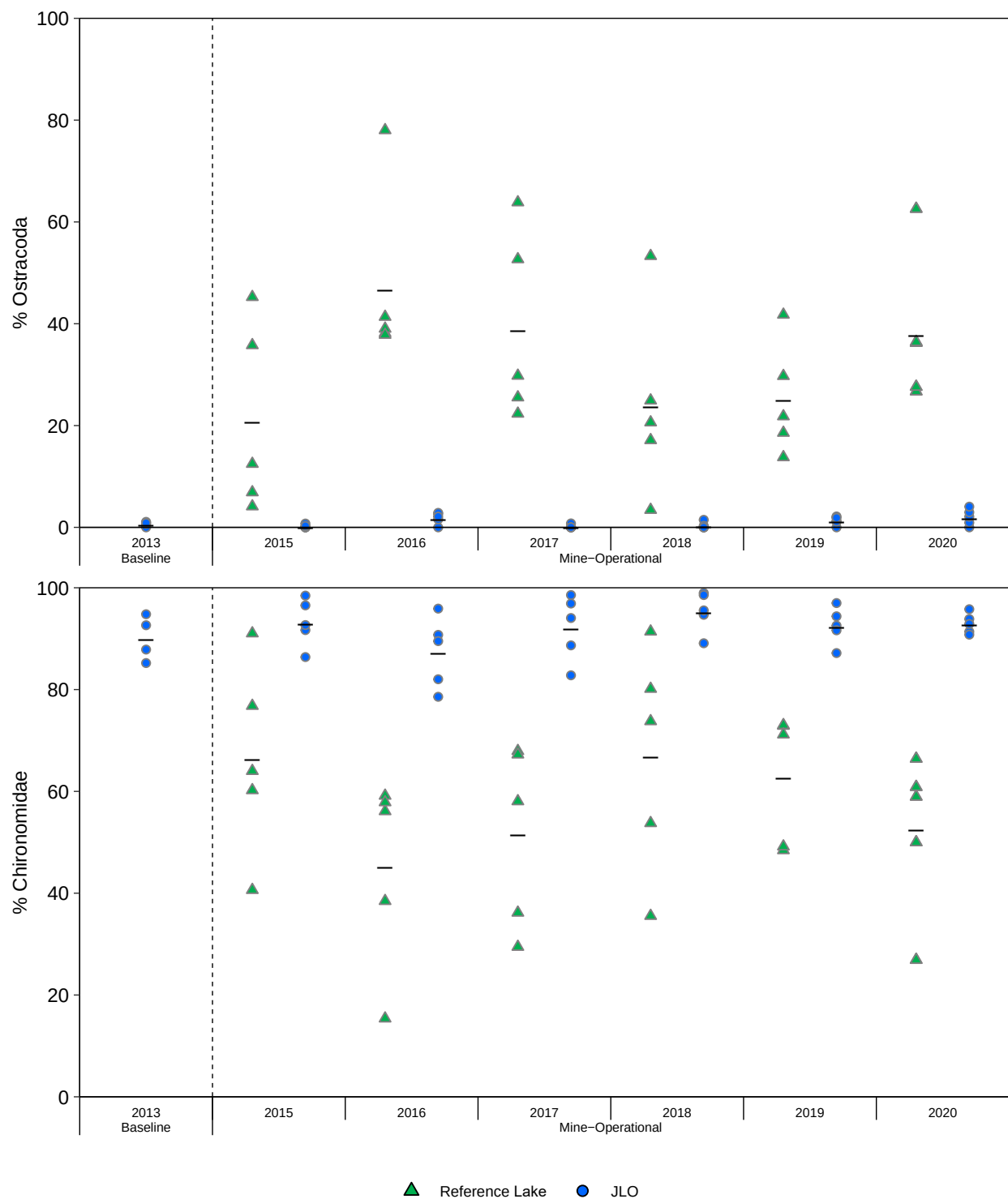


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Note: Black bars indicate average of replicates.

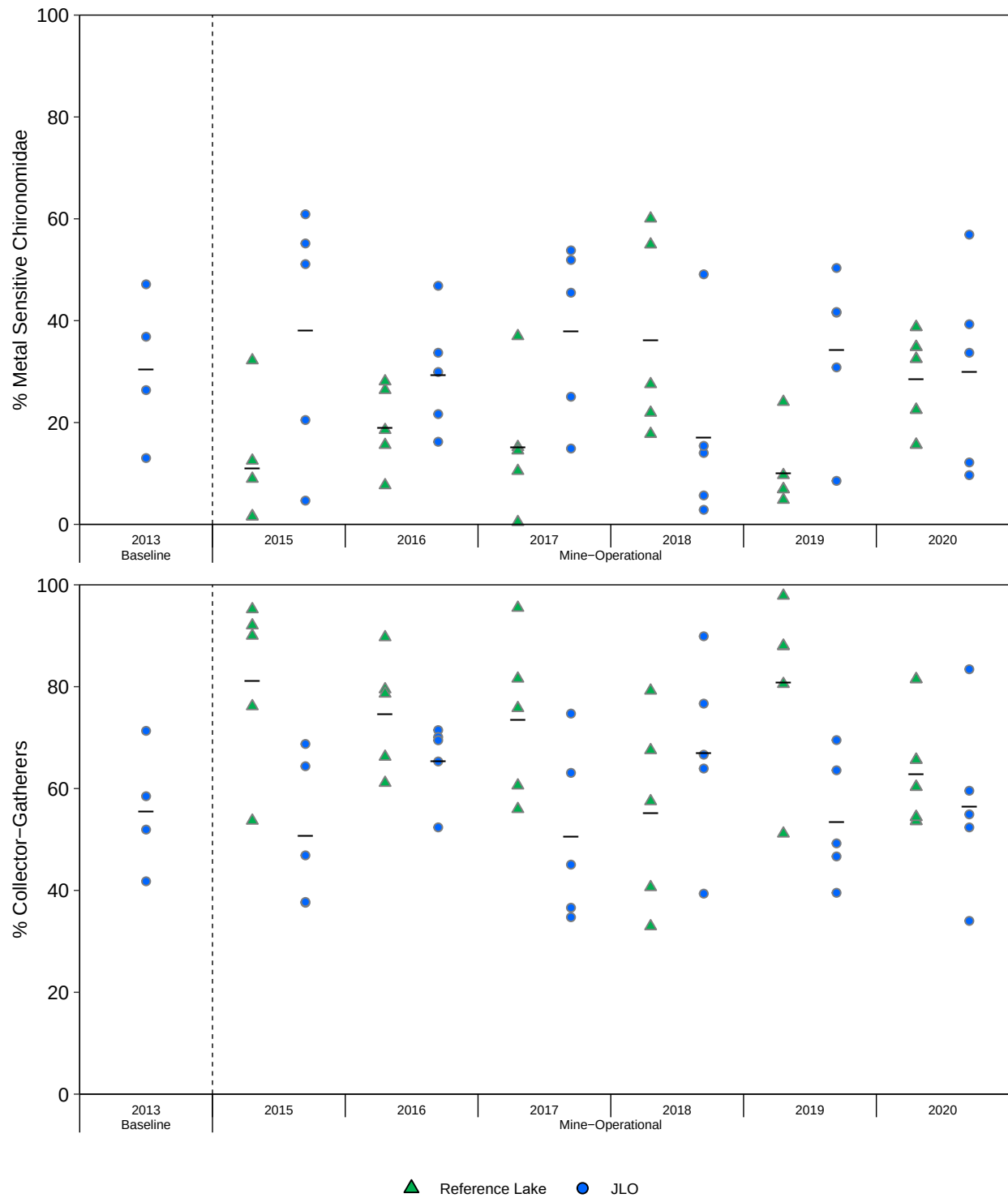


**Figure F.5: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

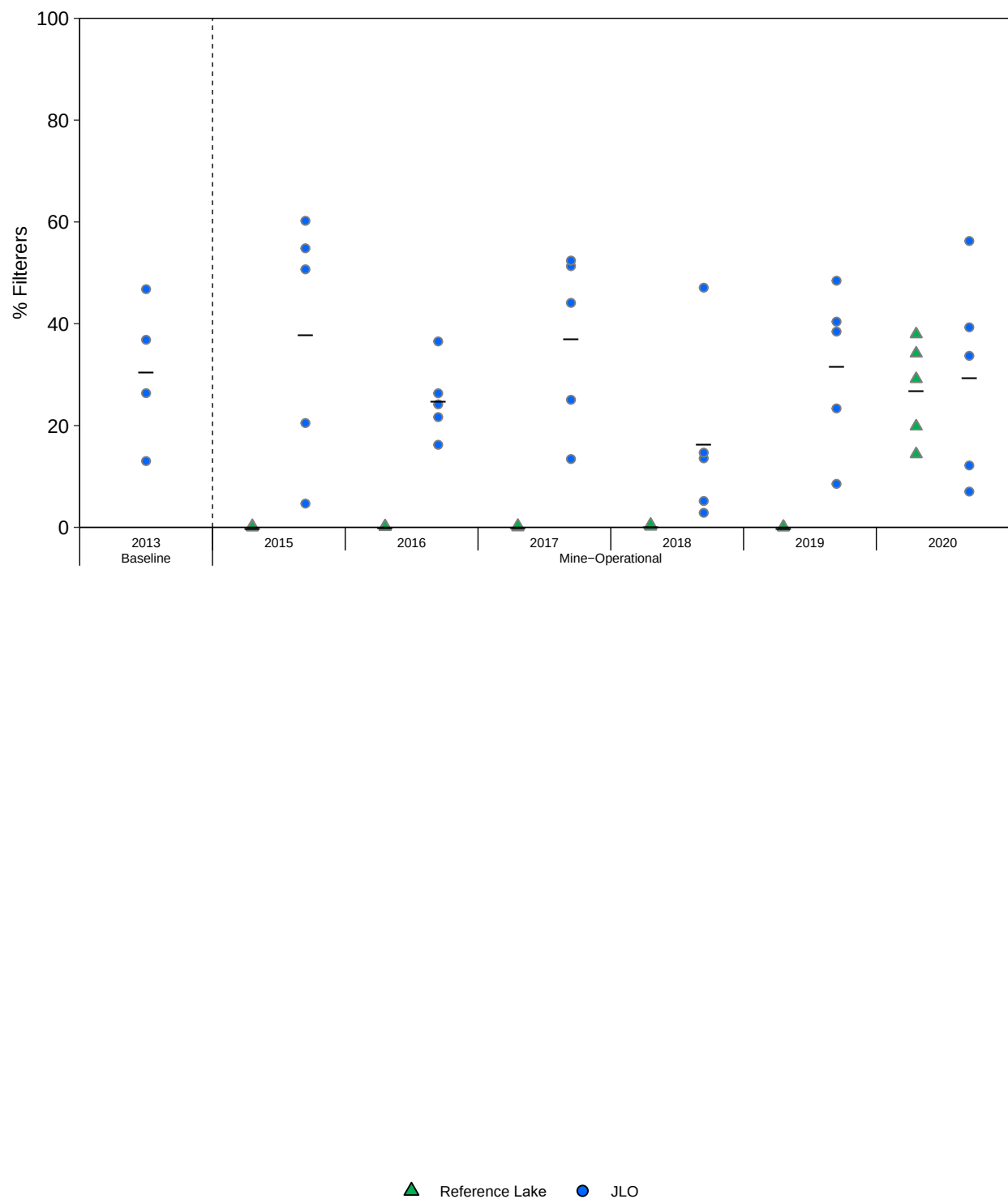


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Note: Black bars indicate average of replicates.



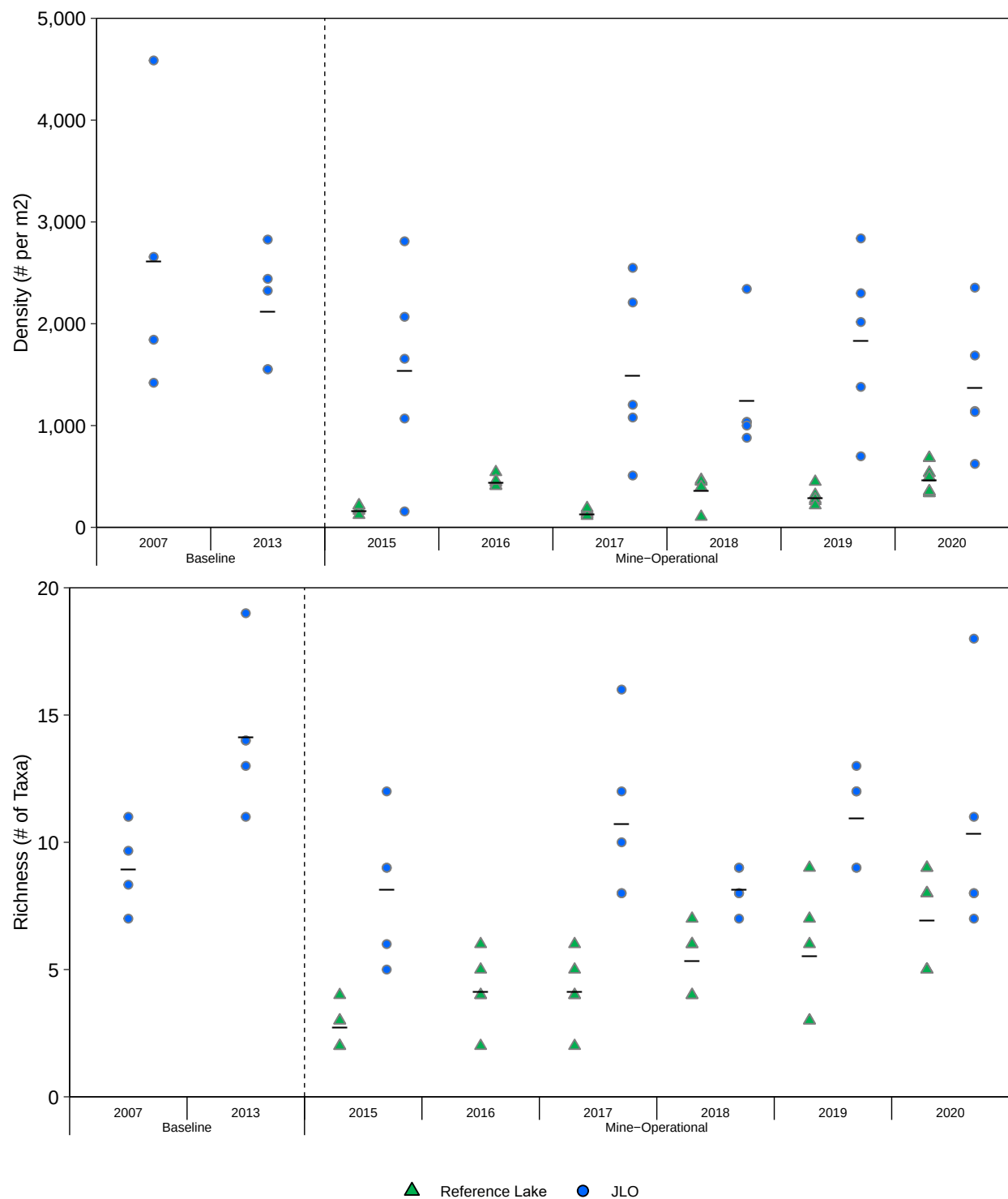


**Figure F.6: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

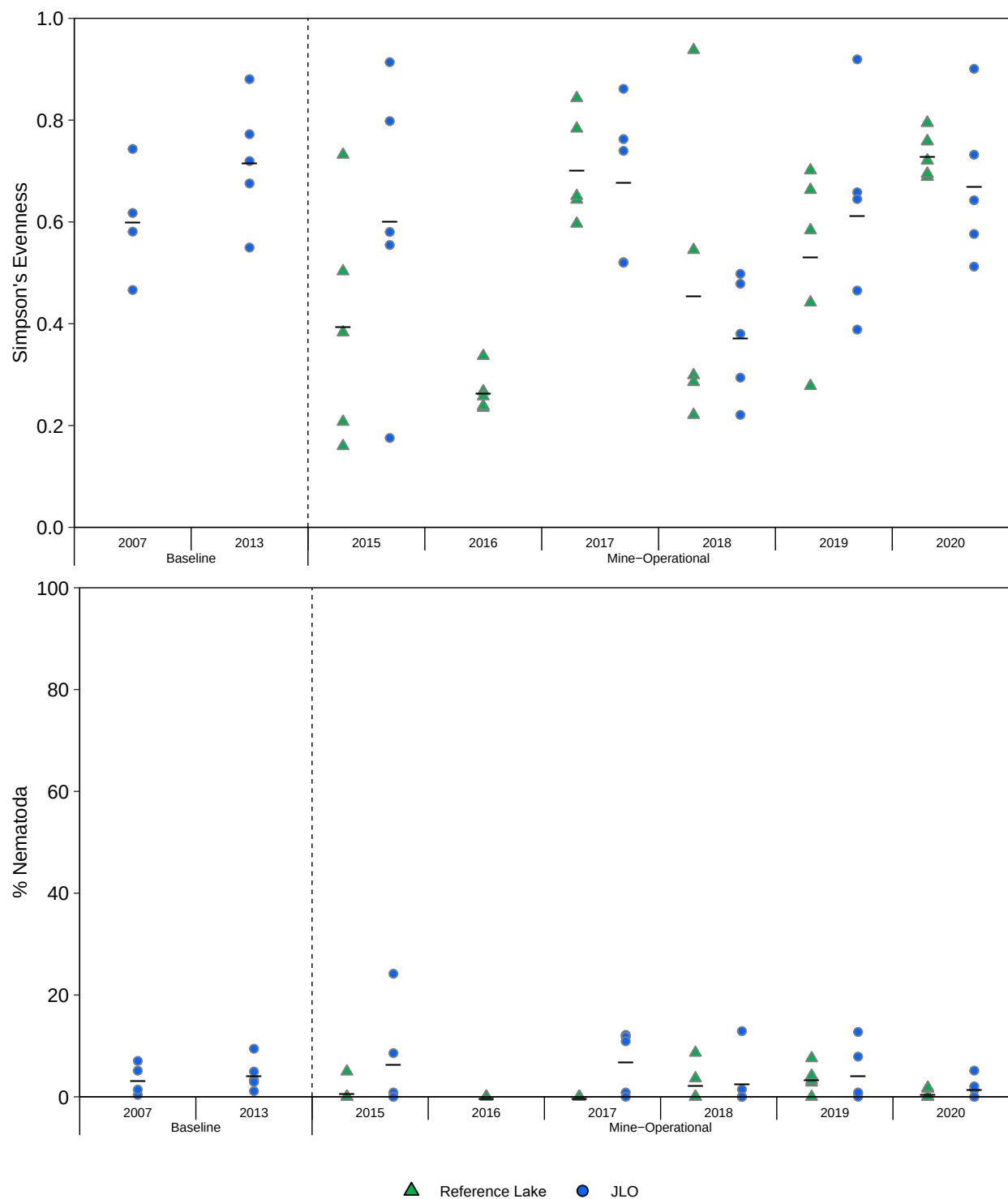


**Figure F.6: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

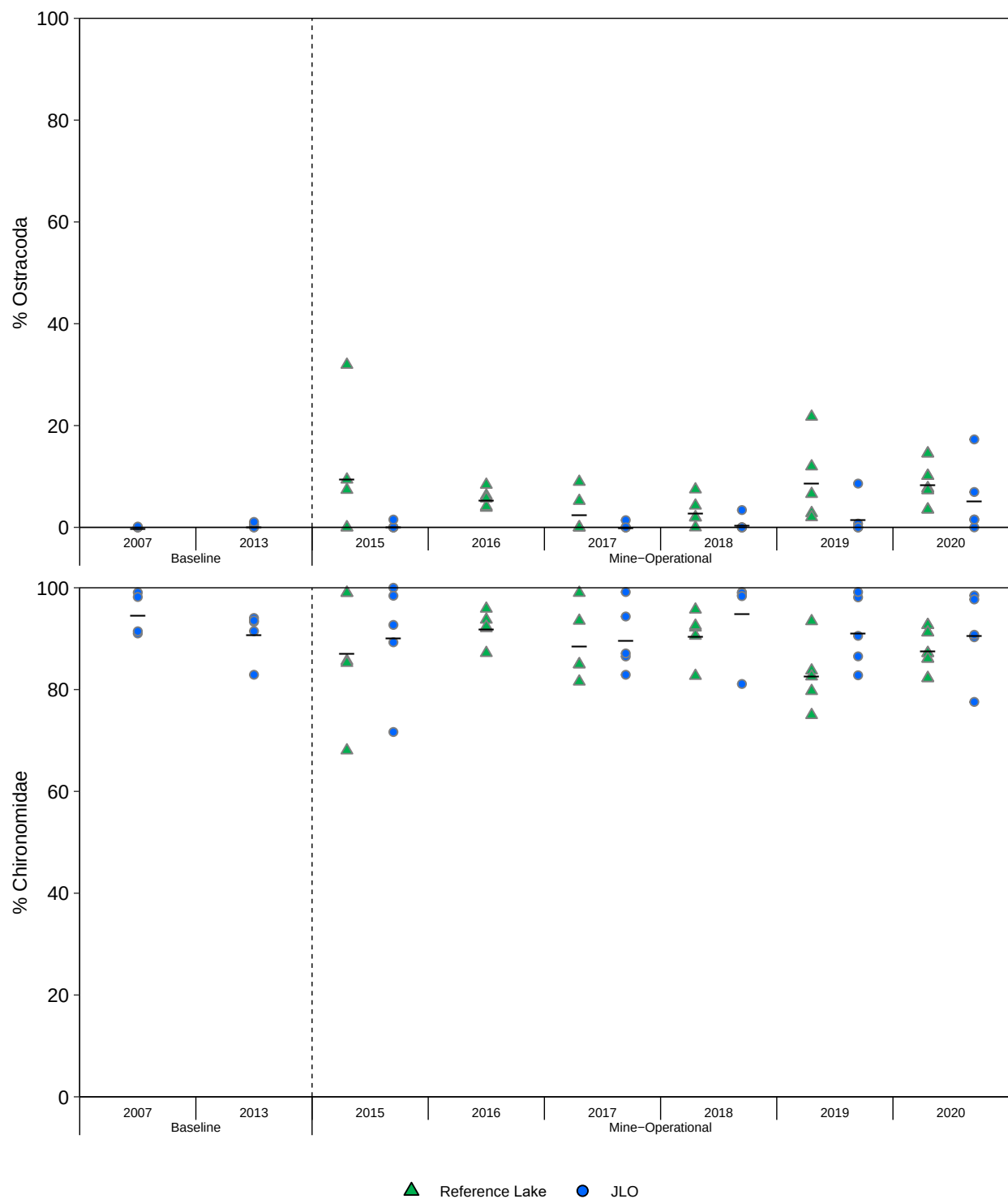


**Figure F.6: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

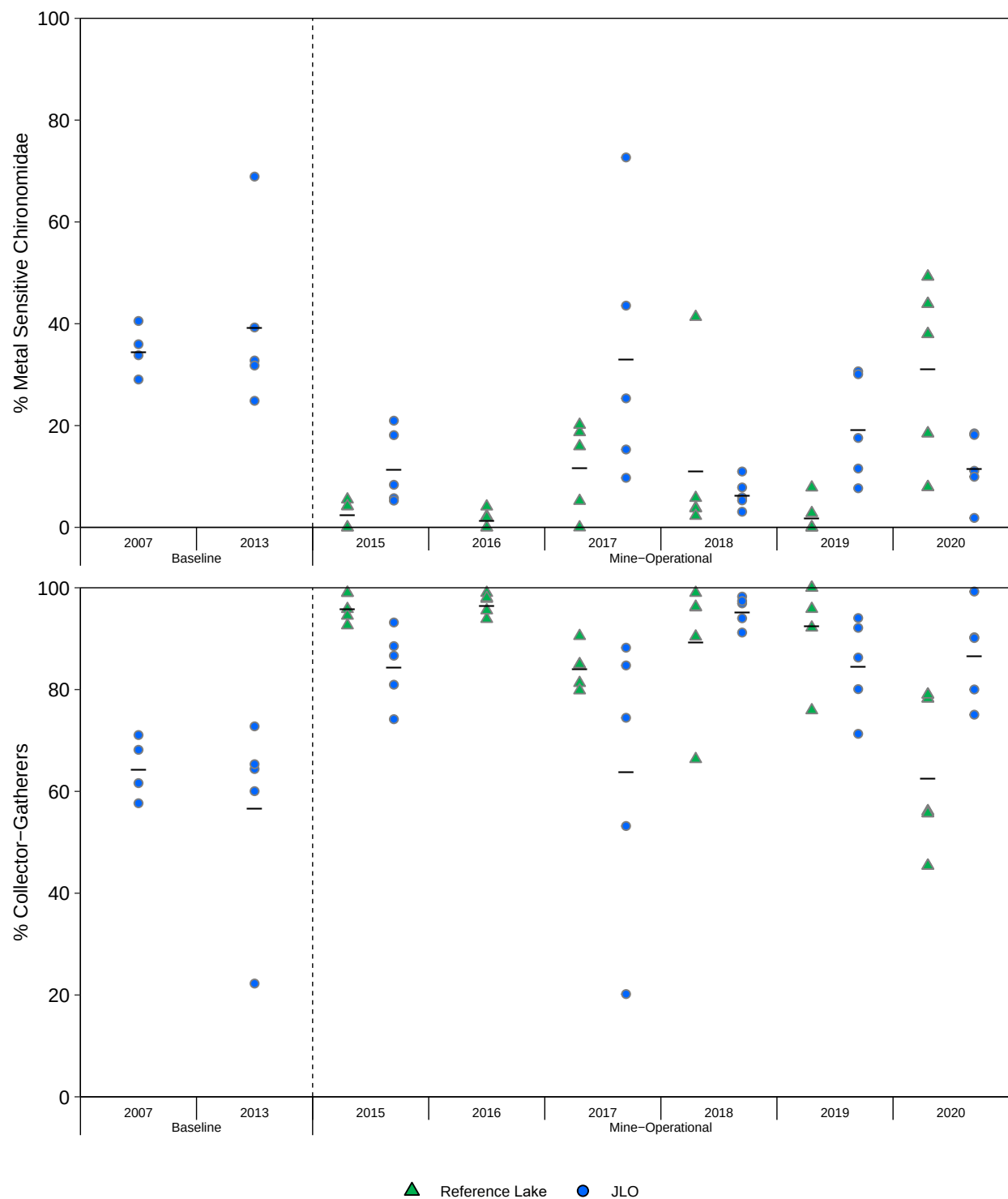


**Figure F.6: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

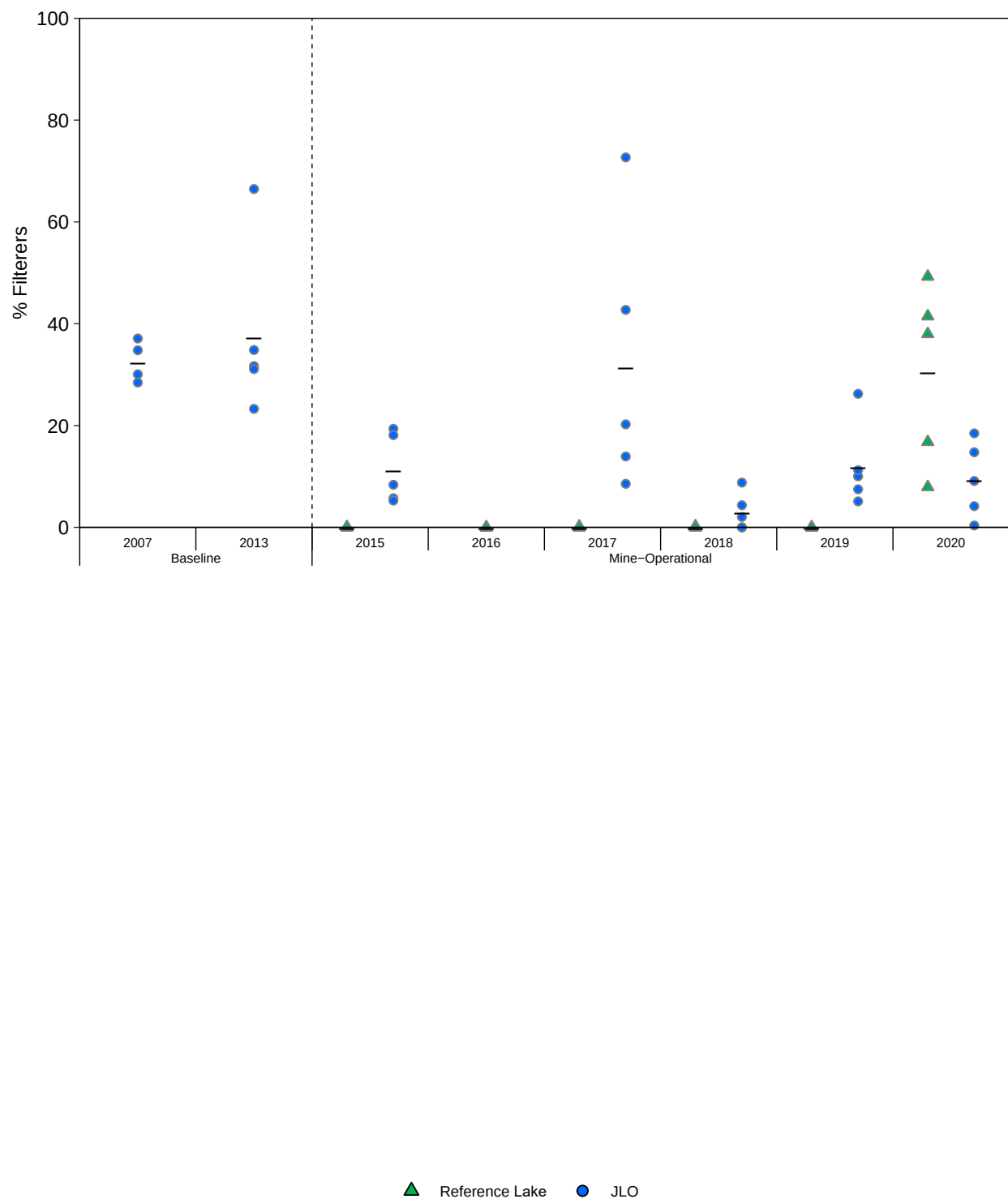


**Figure F.6: Comparison of Key Benthic Invertebrate Community Metrics at Camp Lake (JLO) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

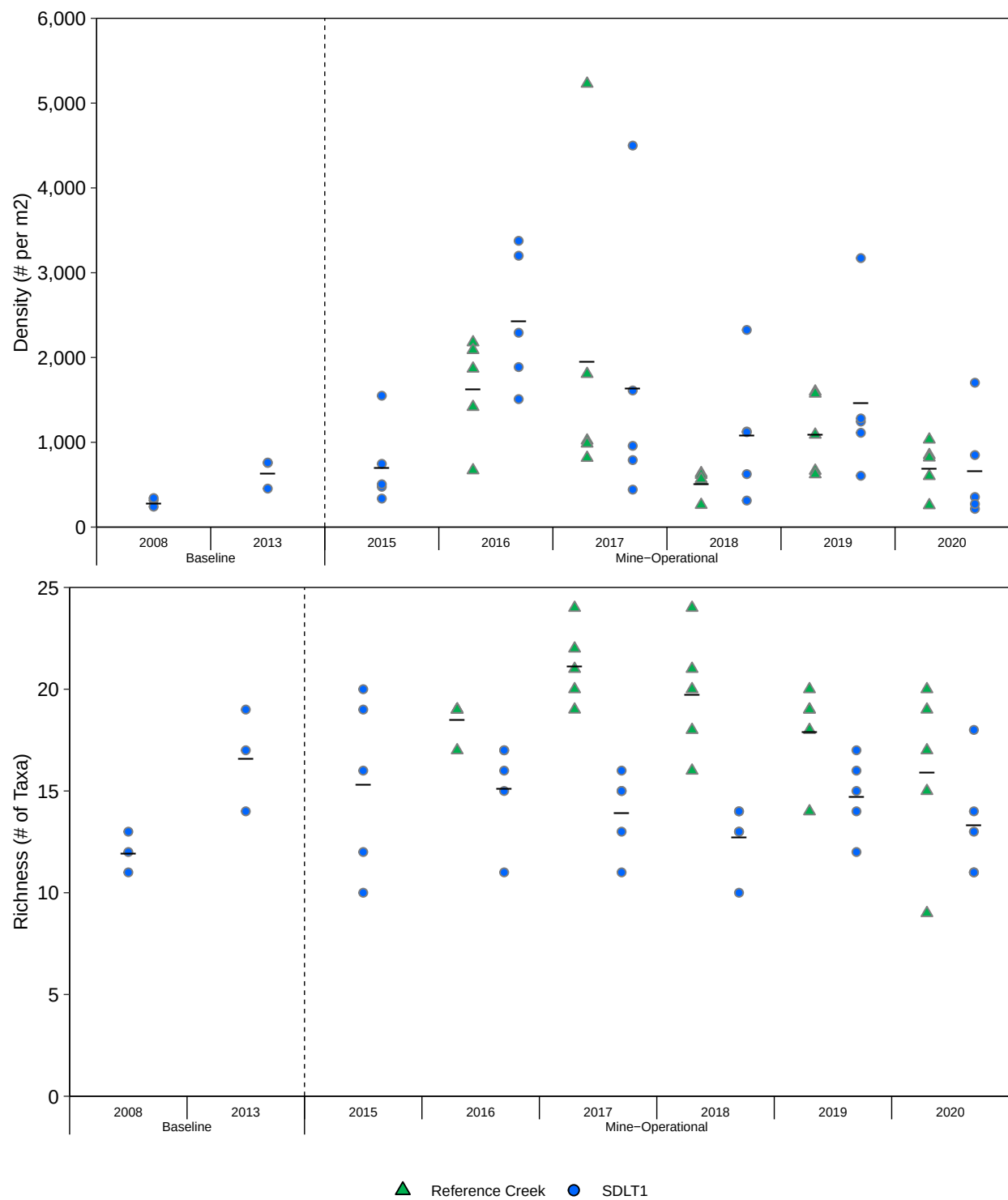


**Figure F.7: Temporal Comparison of Benthic Endpoints at SDLT1 Over Mine Baseline (2008 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

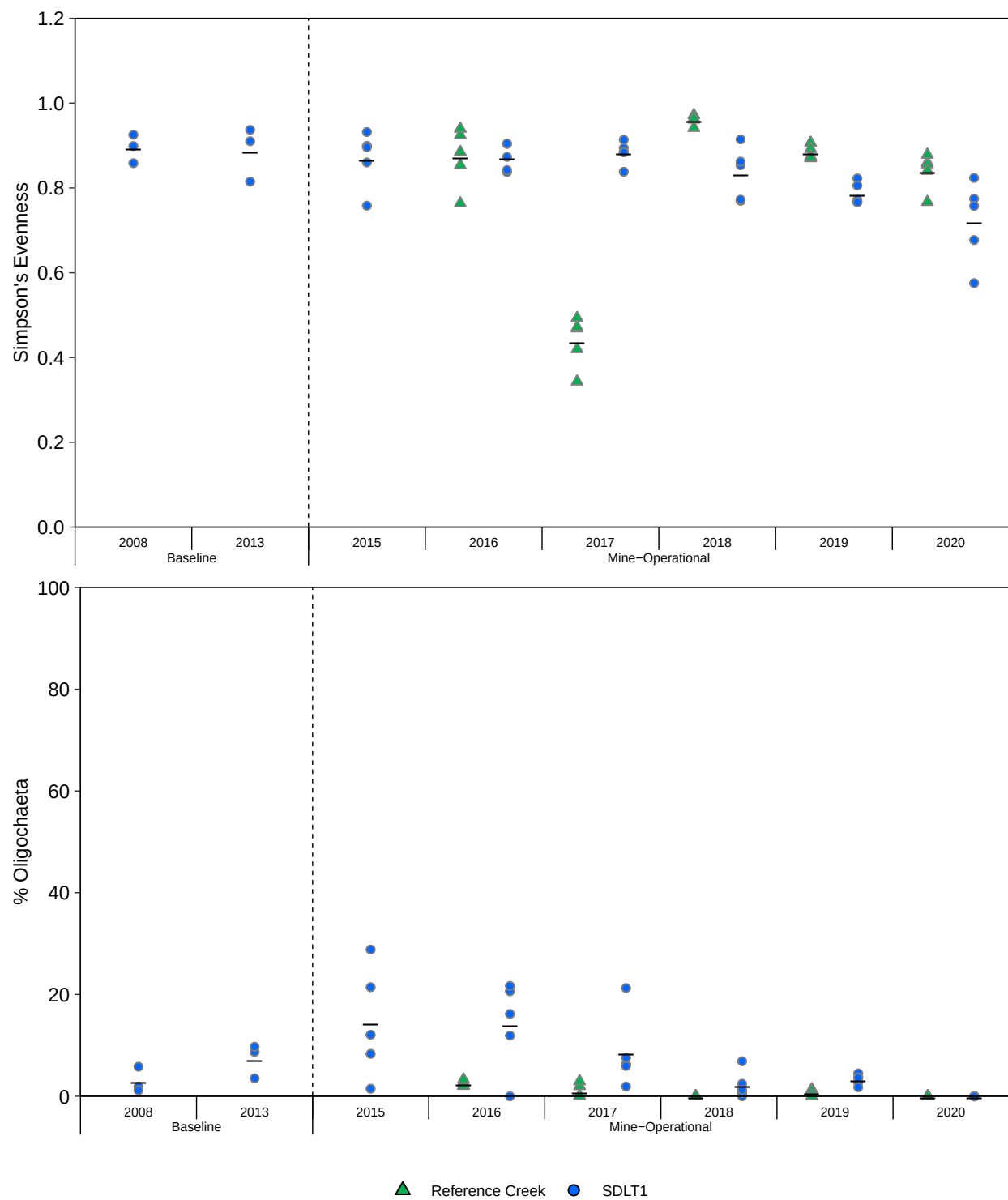


**Figure F.7: Temporal Comparison of Benthic Endpoints at SDLT1 Over Mine Baseline (2008 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

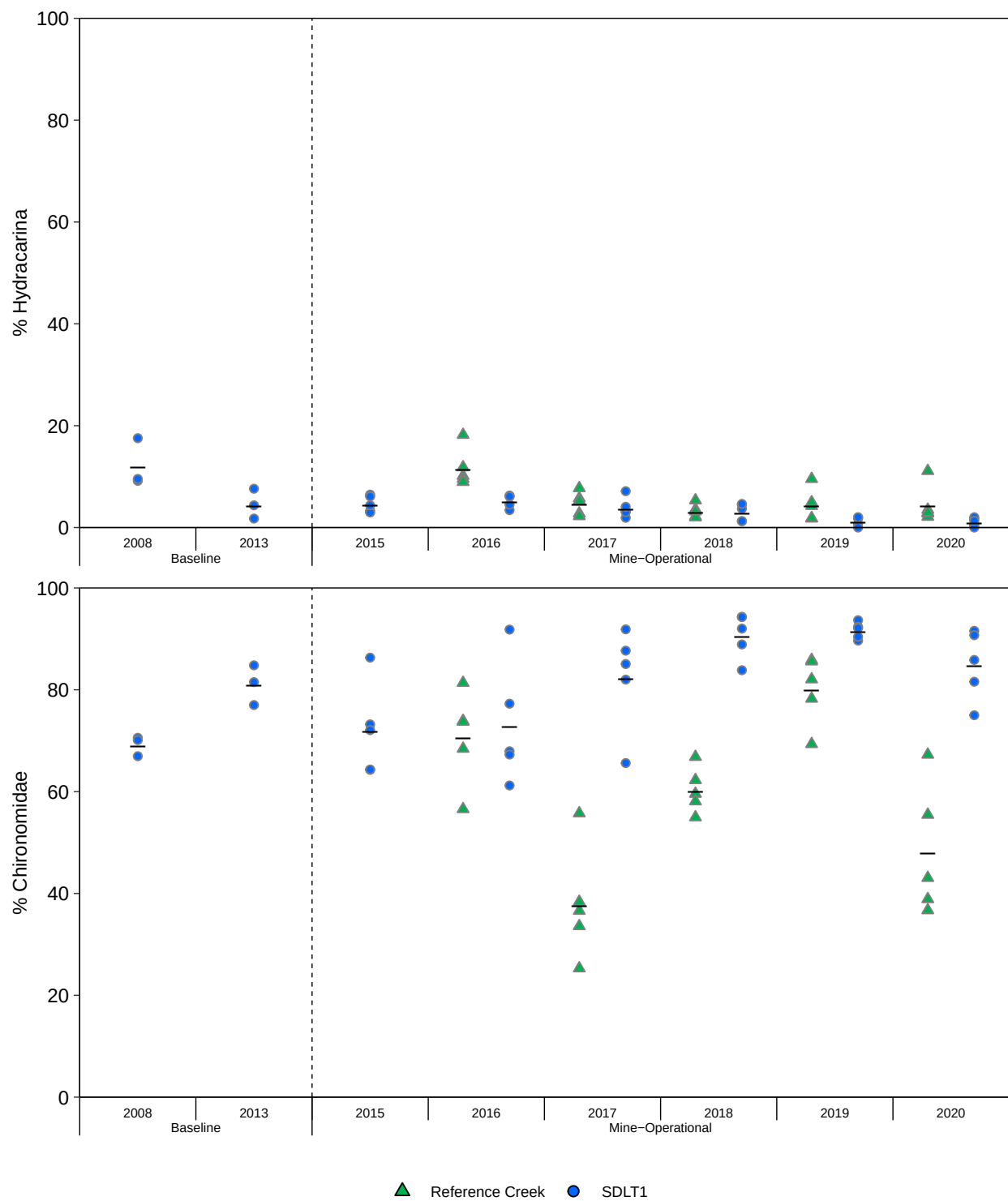


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Note: Black bars indicate average of replicates.



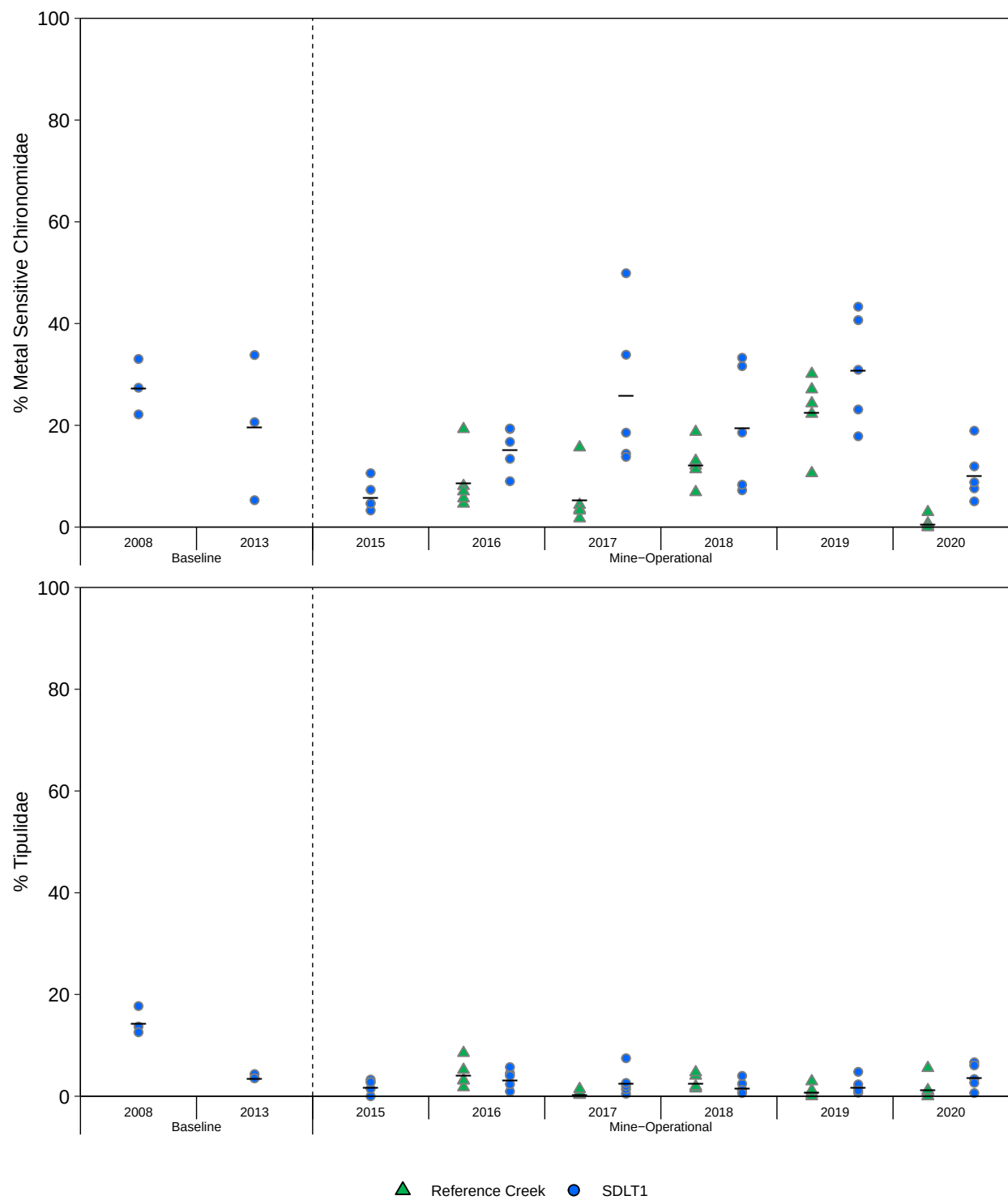


**Figure F.7: Temporal Comparison of Benthic Endpoints at SDLT1 Over Mine Baseline (2008 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

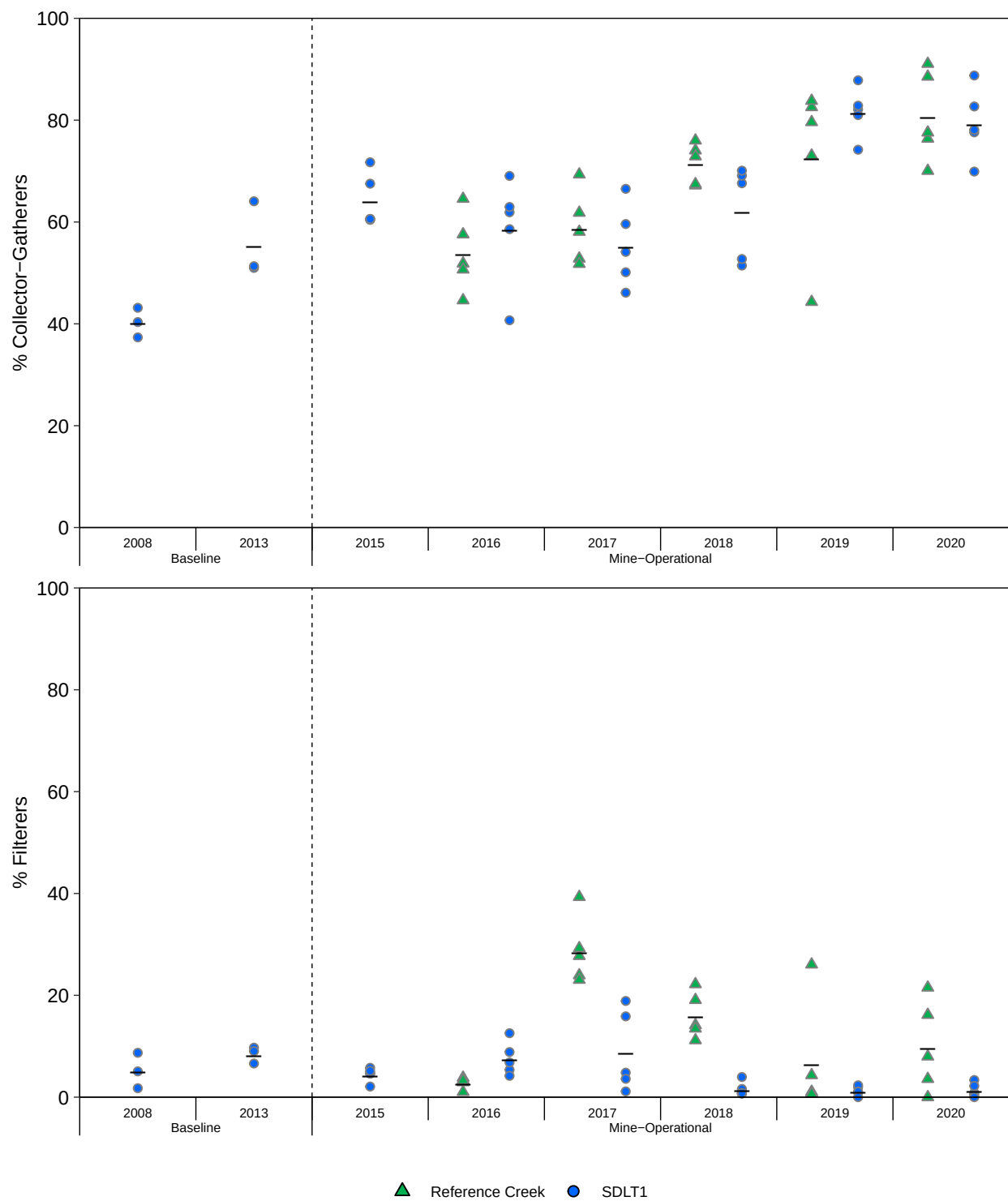


**Figure F.7: Temporal Comparison of Benthic Endpoints at SDLT1 Over Mine Baseline (2008 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

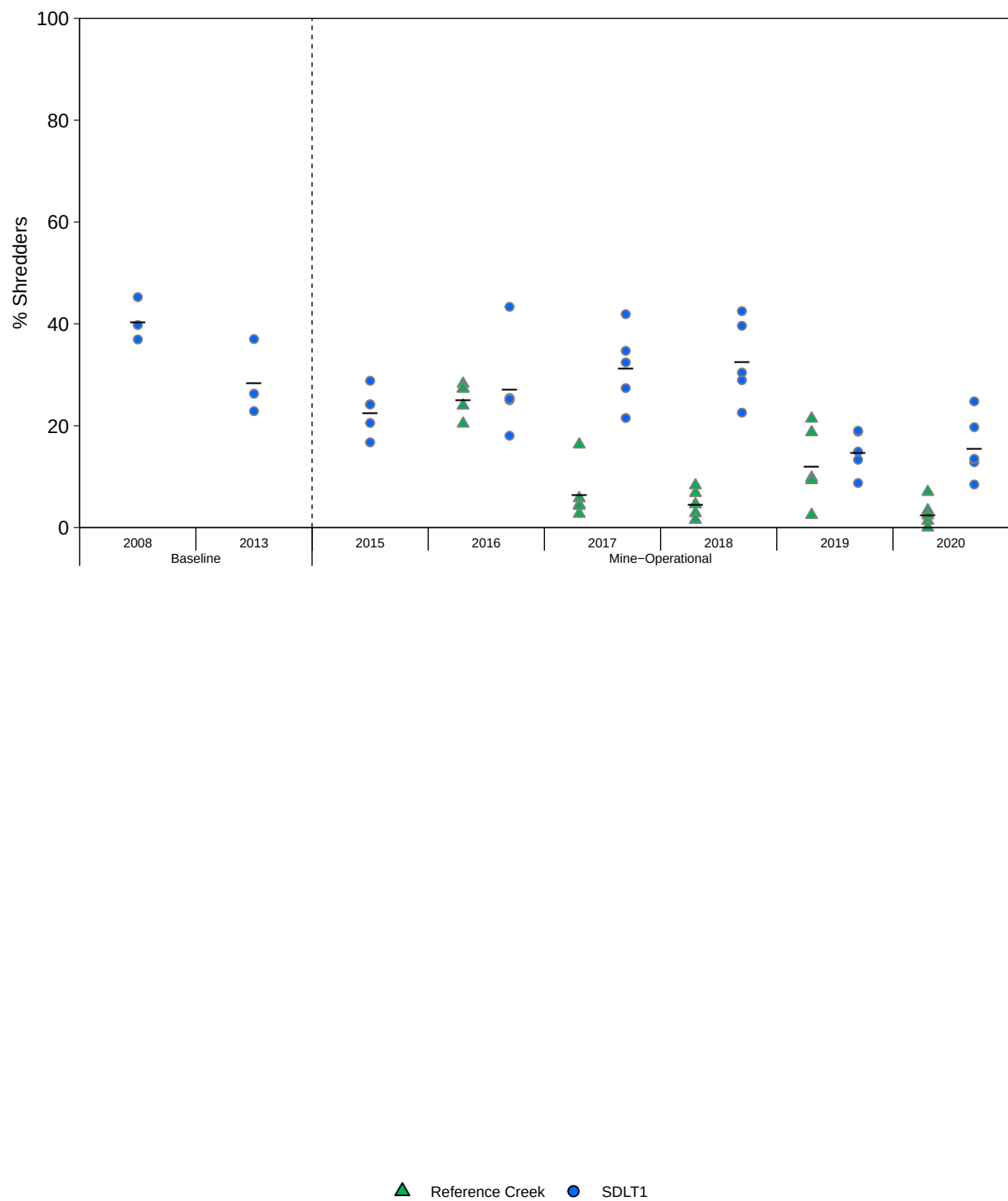


**Figure F.7: Temporal Comparison of Benthic Endpoints at SDLT1 Over Mine Baseline (2008 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

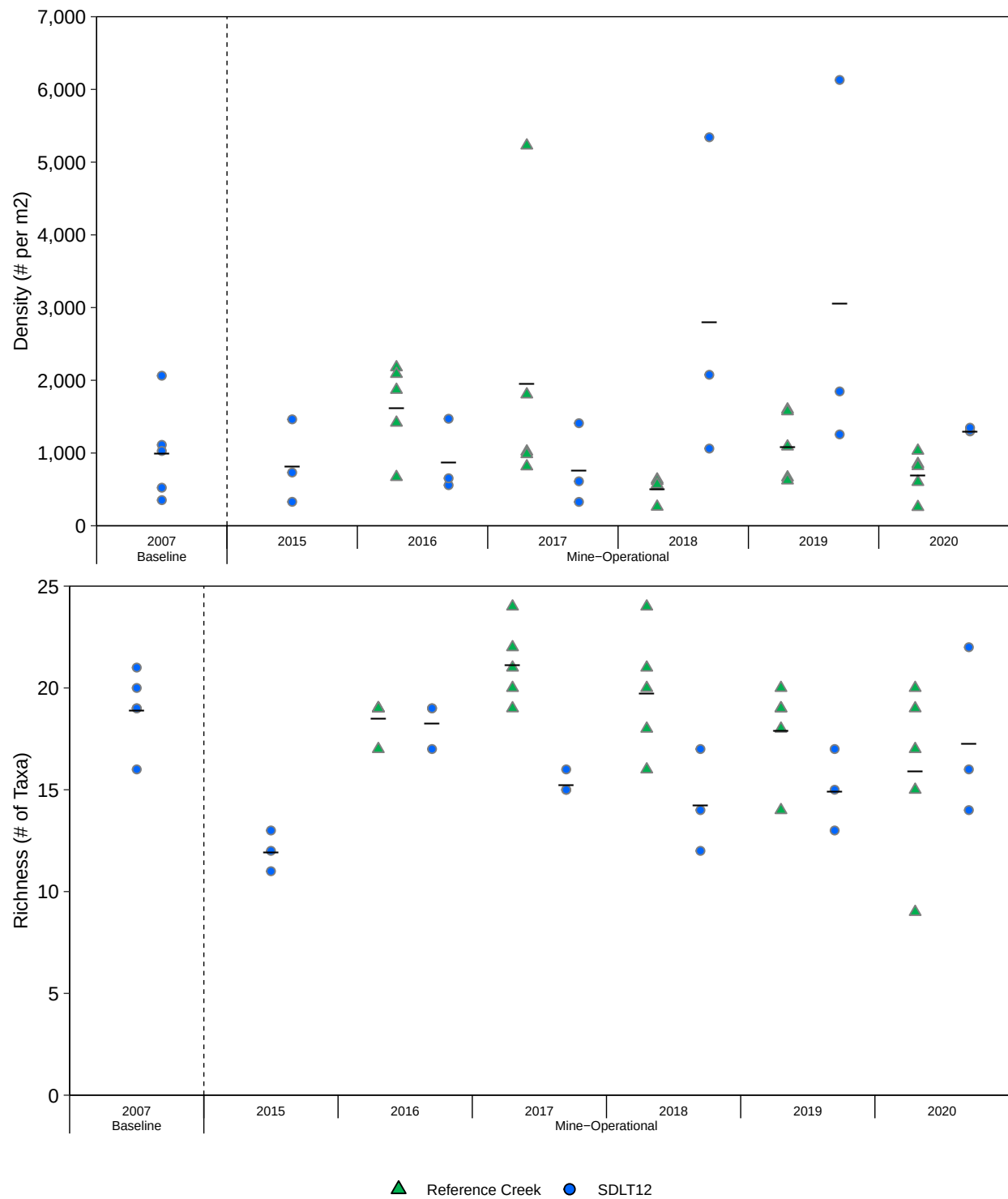


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

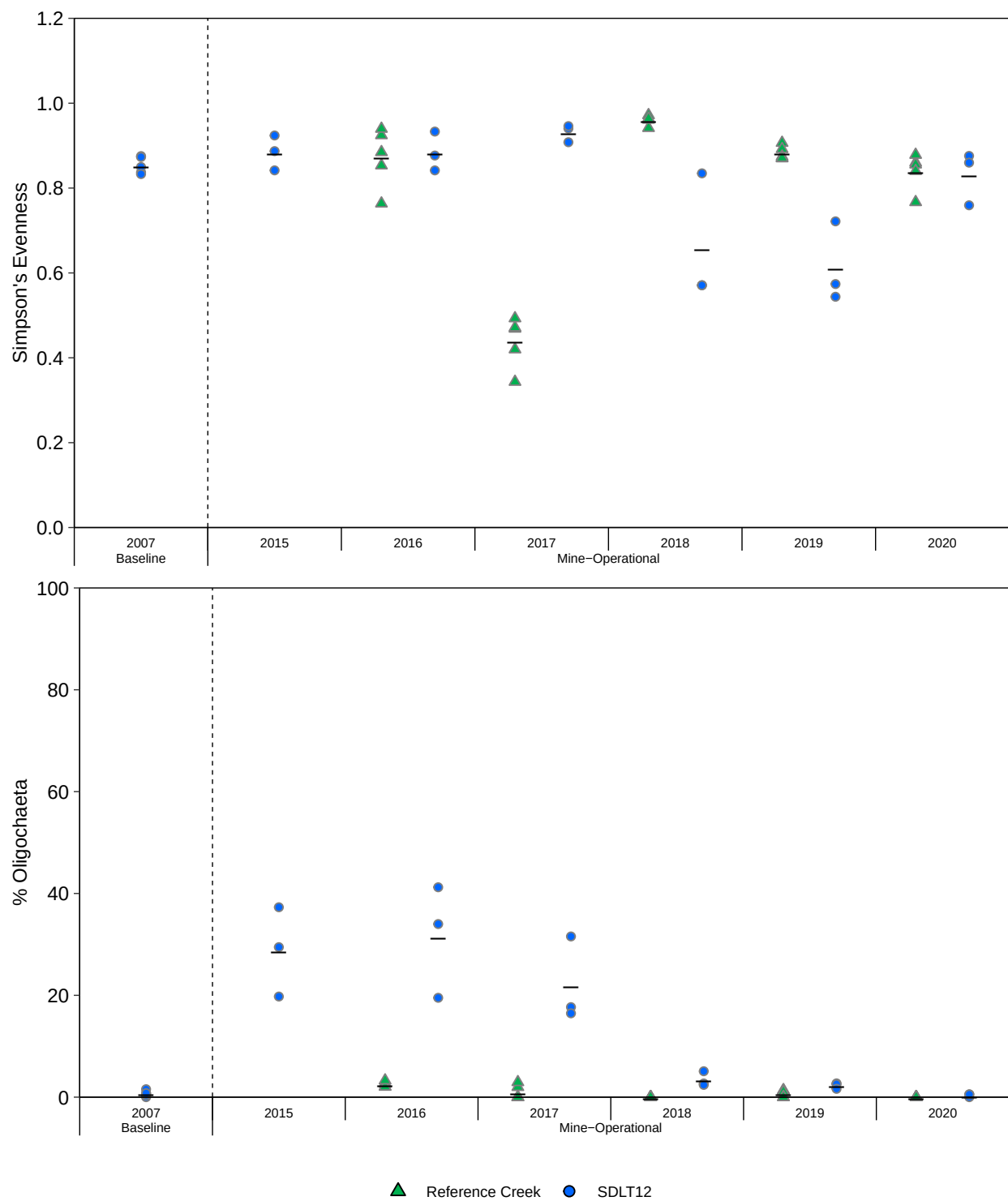


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

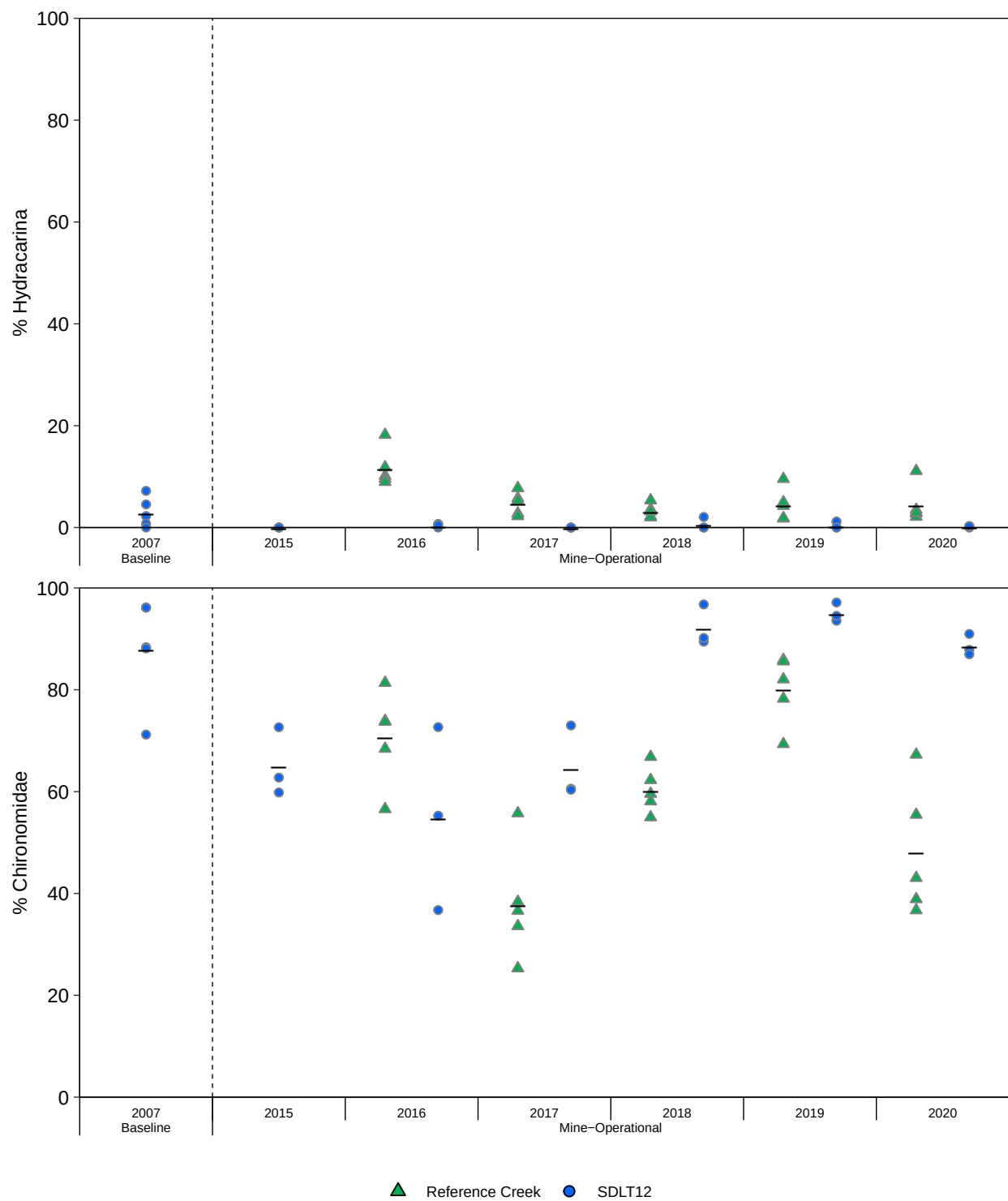


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

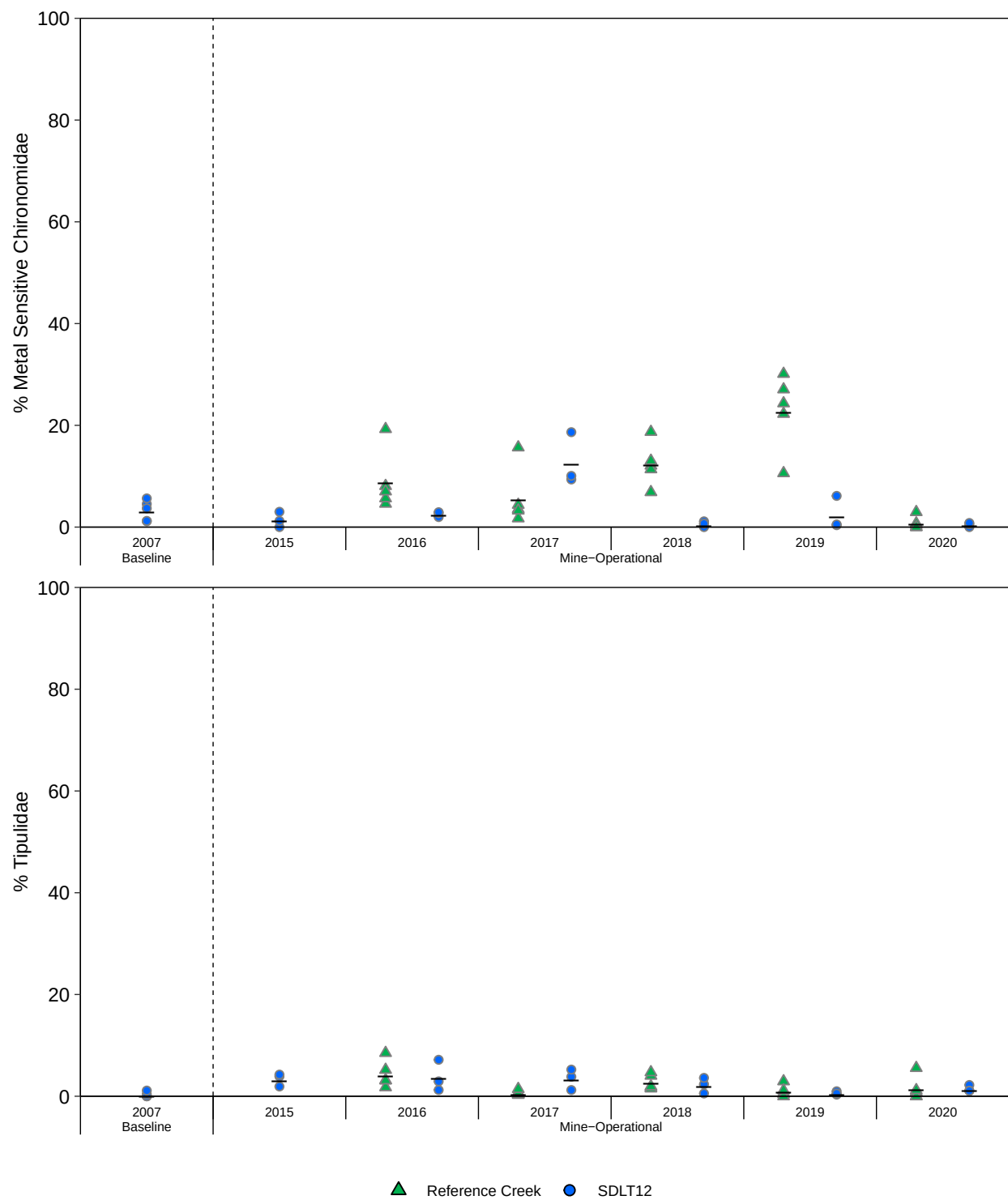


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

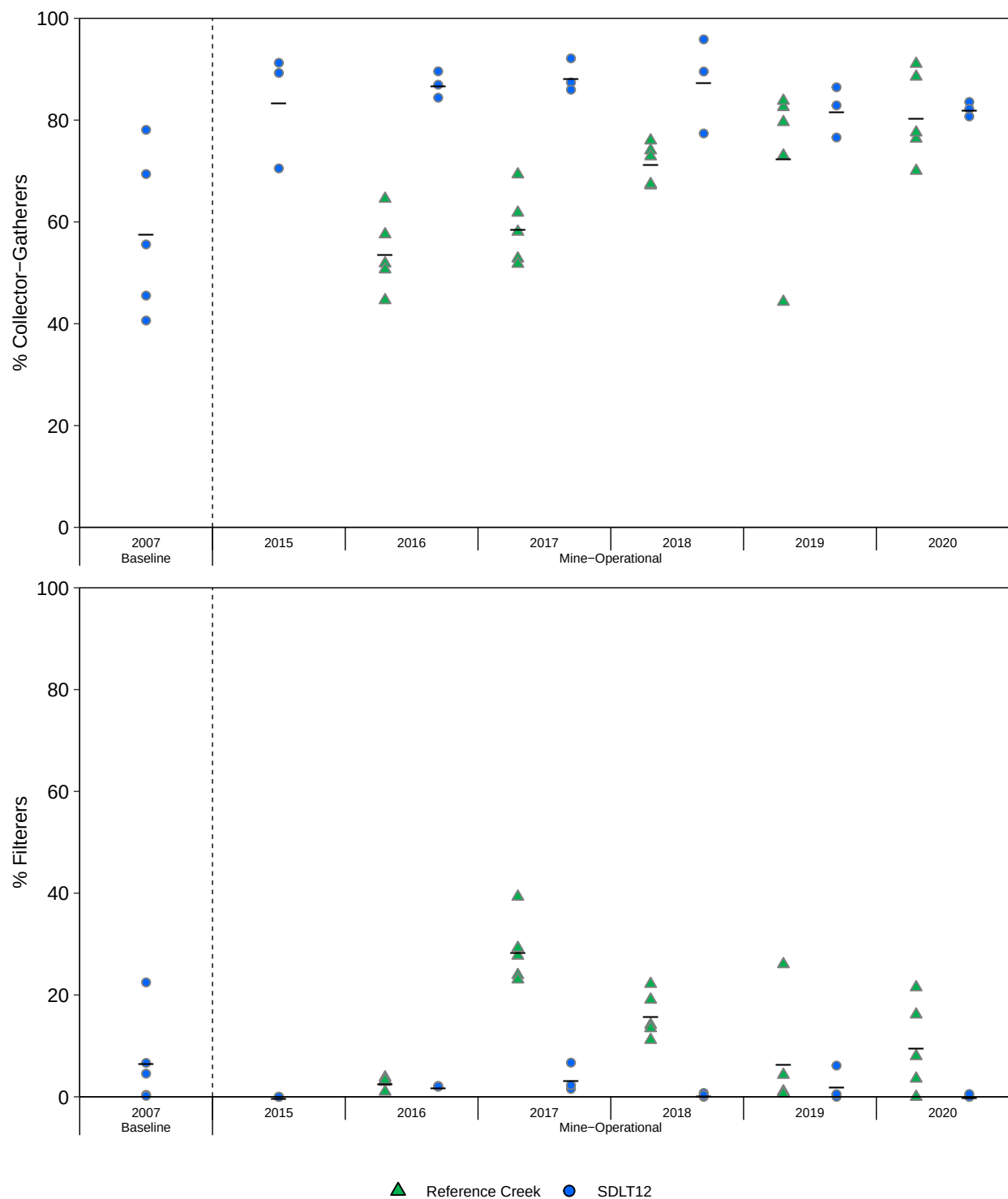


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



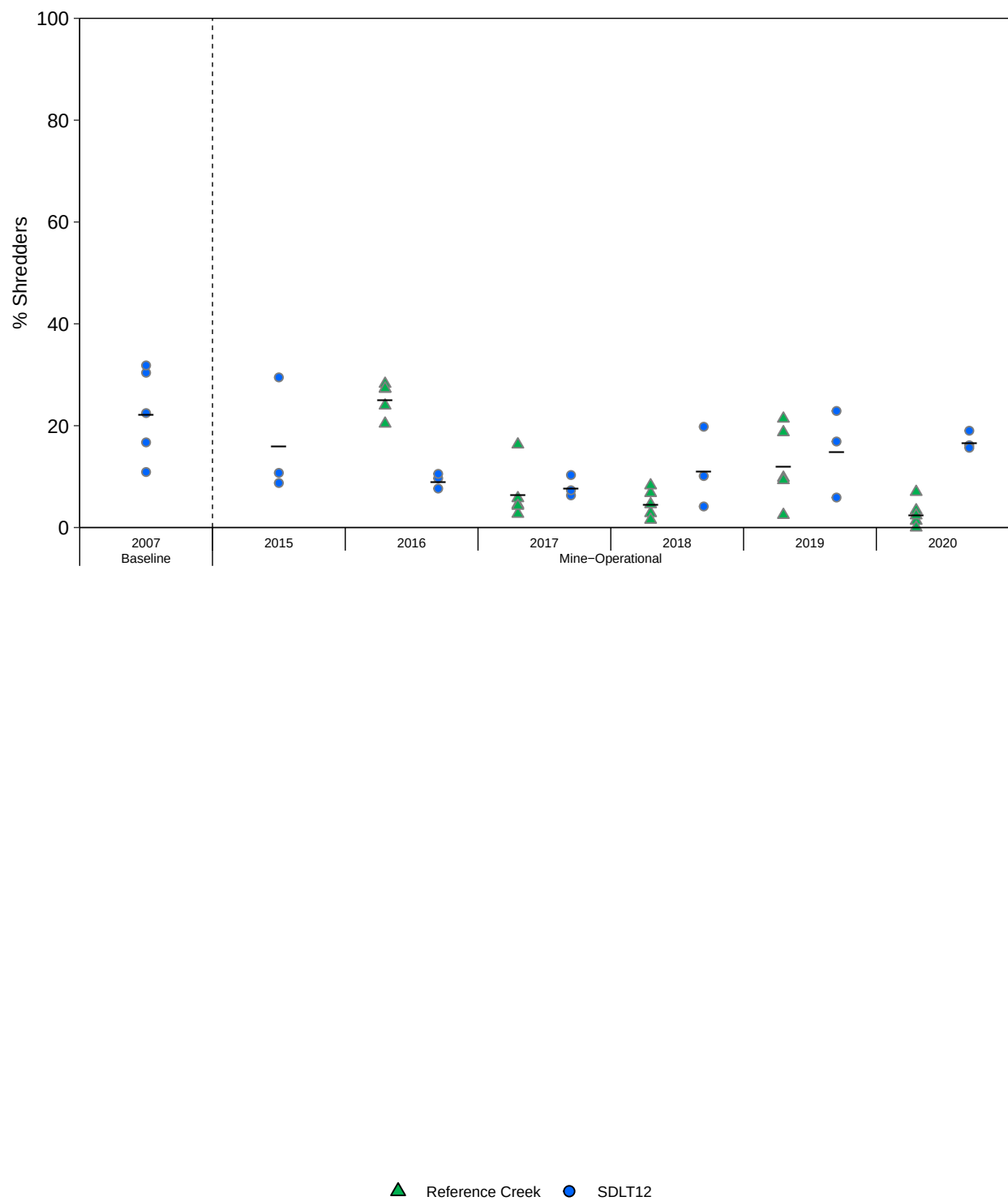


**Figure F.8: Temporal Comparison of Benthic Endpoints at SDLT12 Over Mine Baseline (2007) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

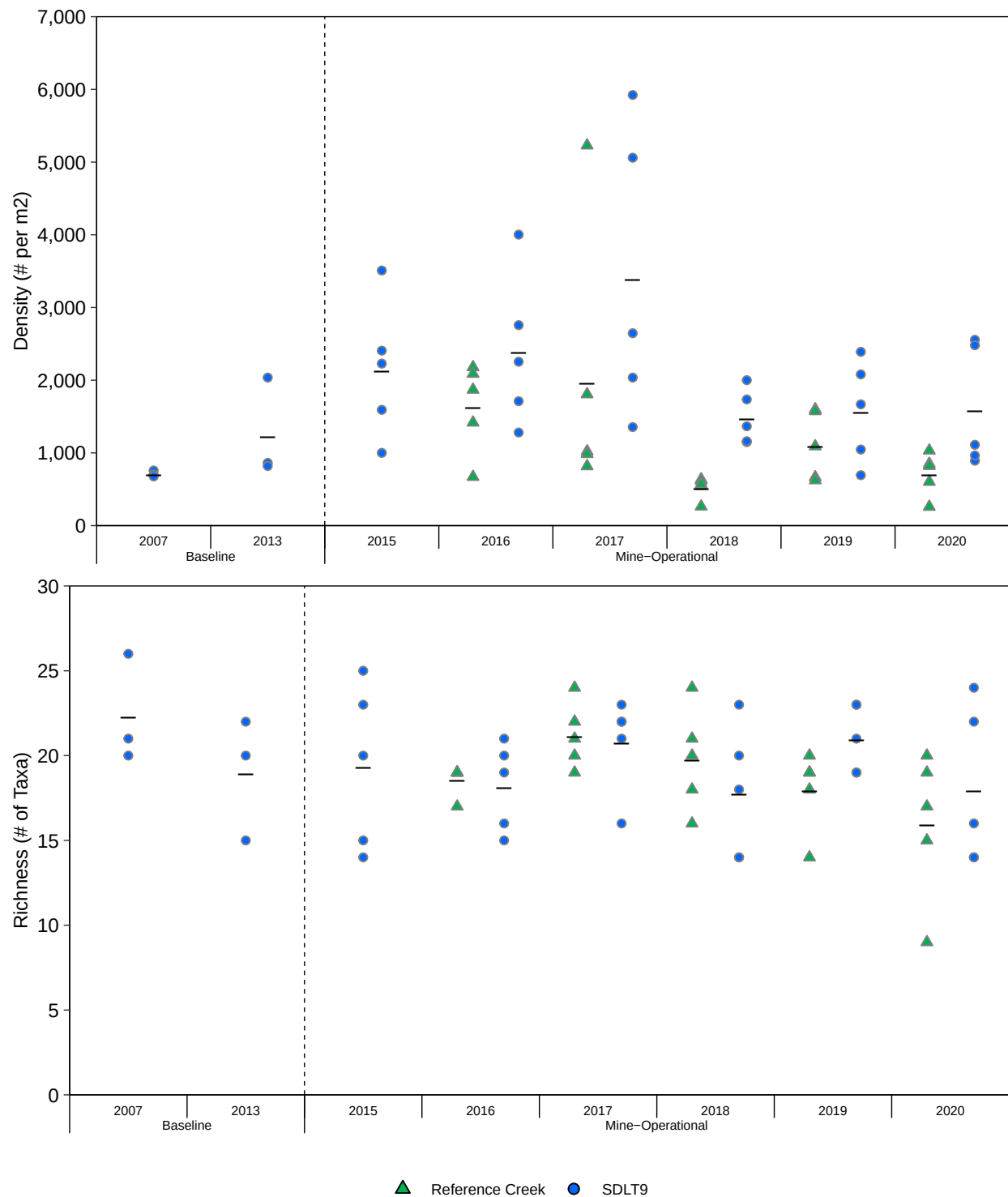


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

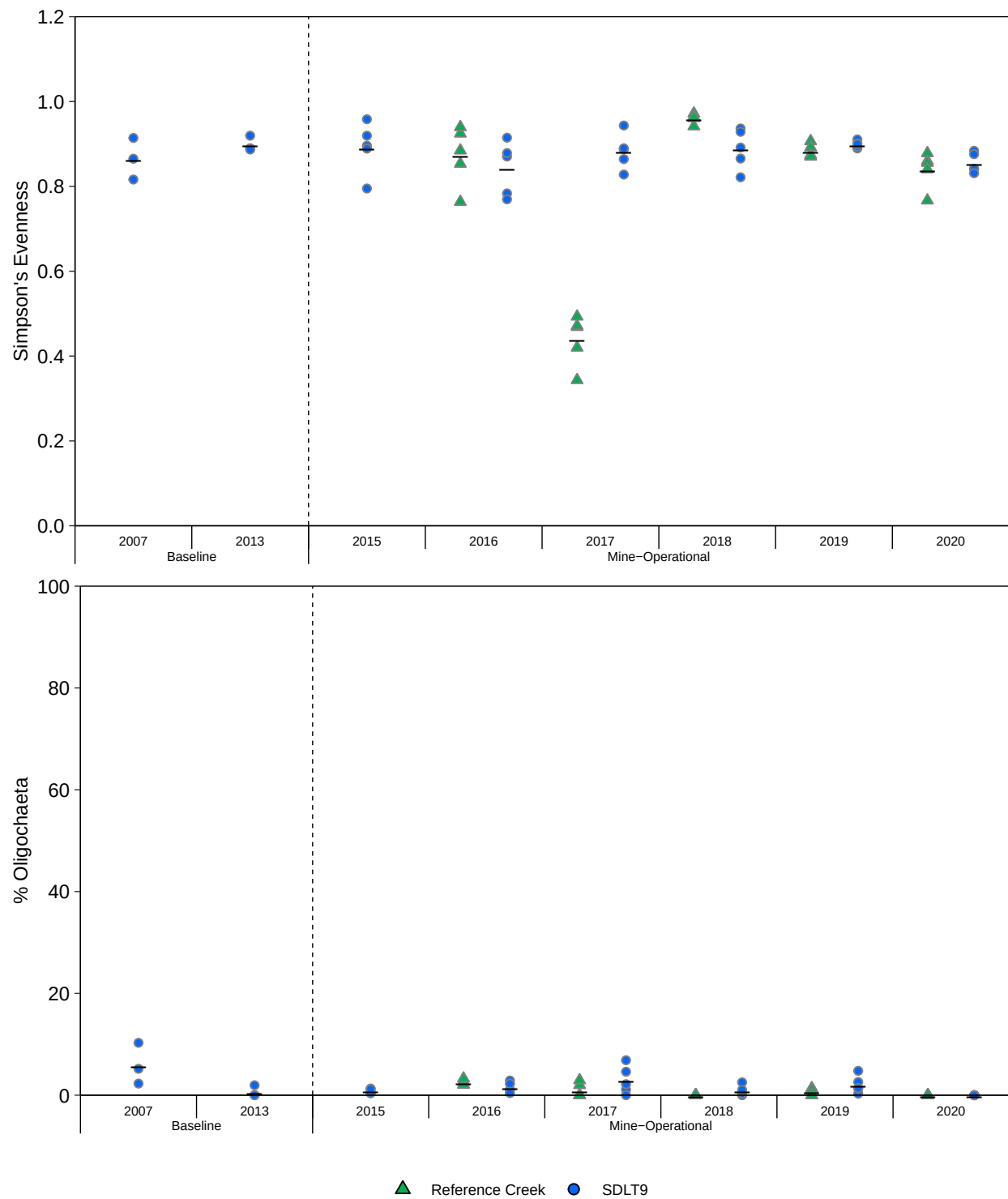


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

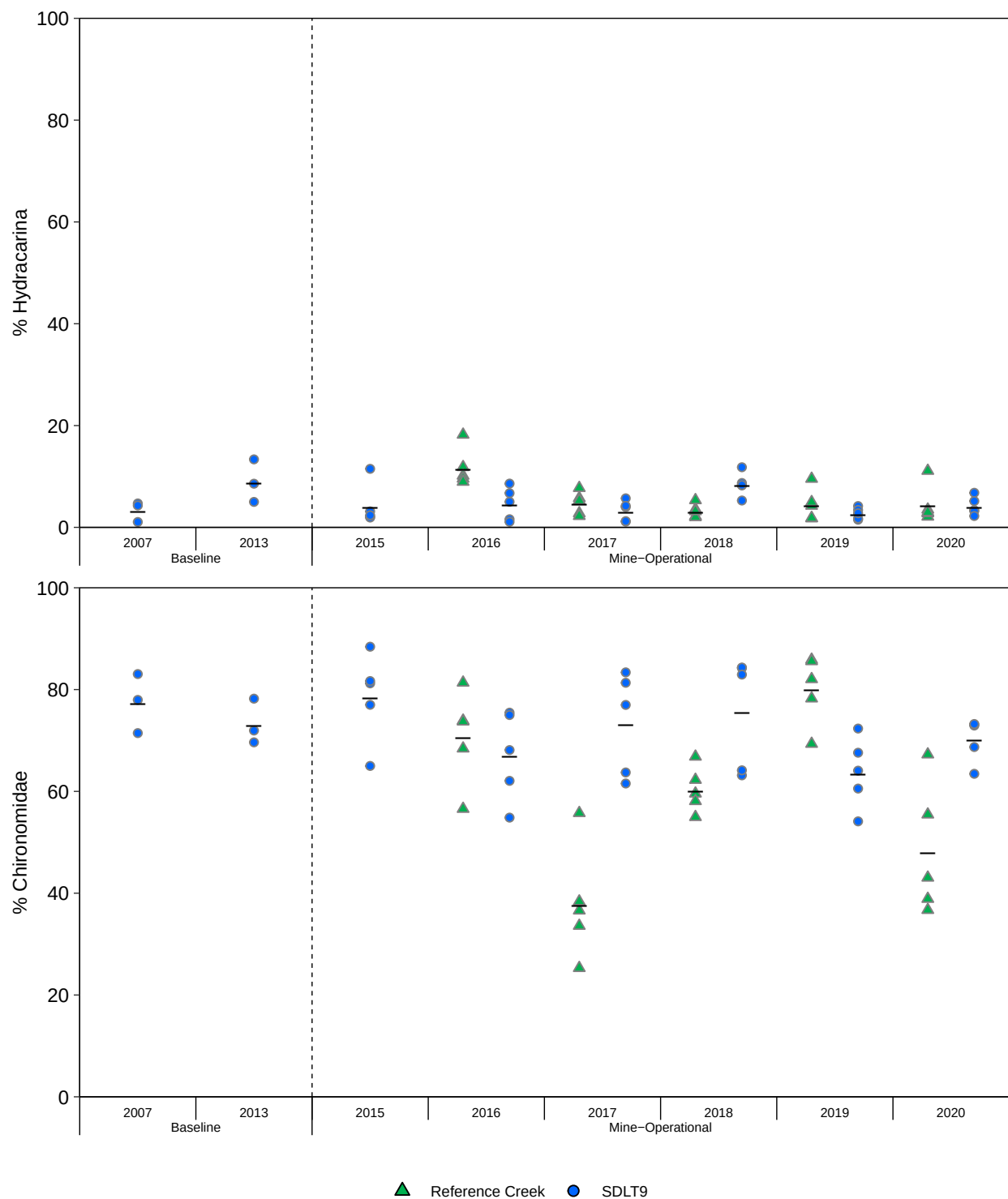


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

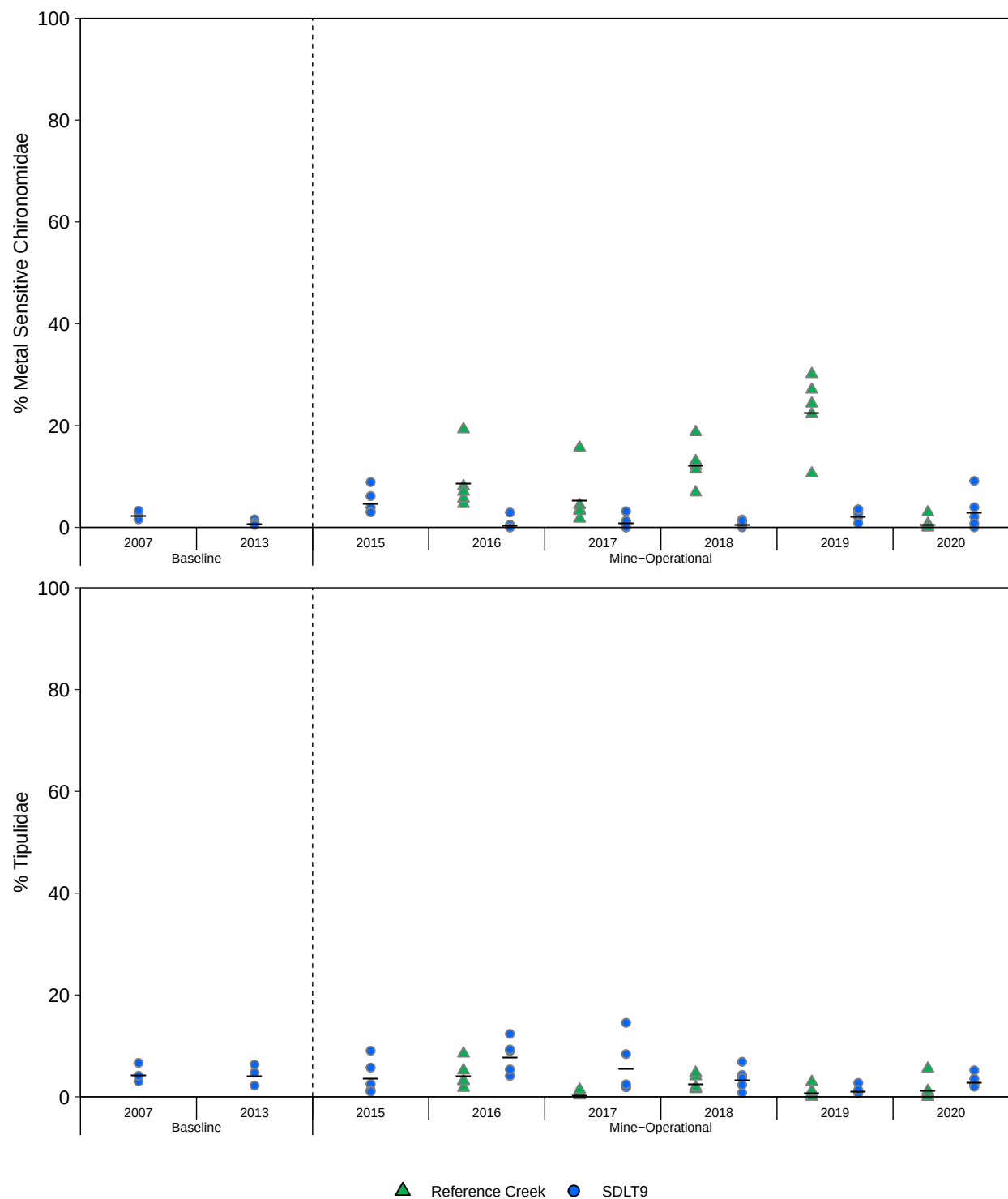


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

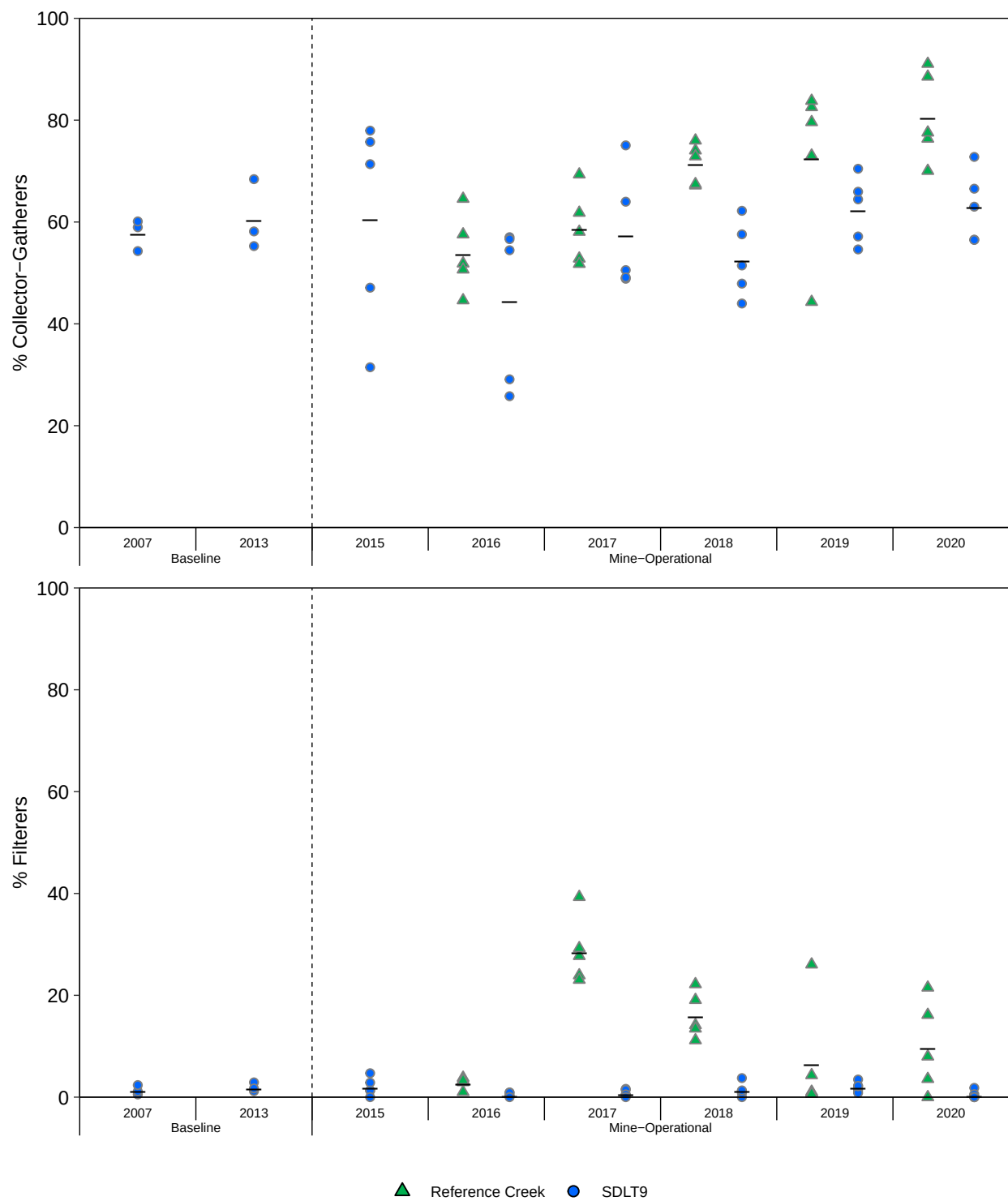


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

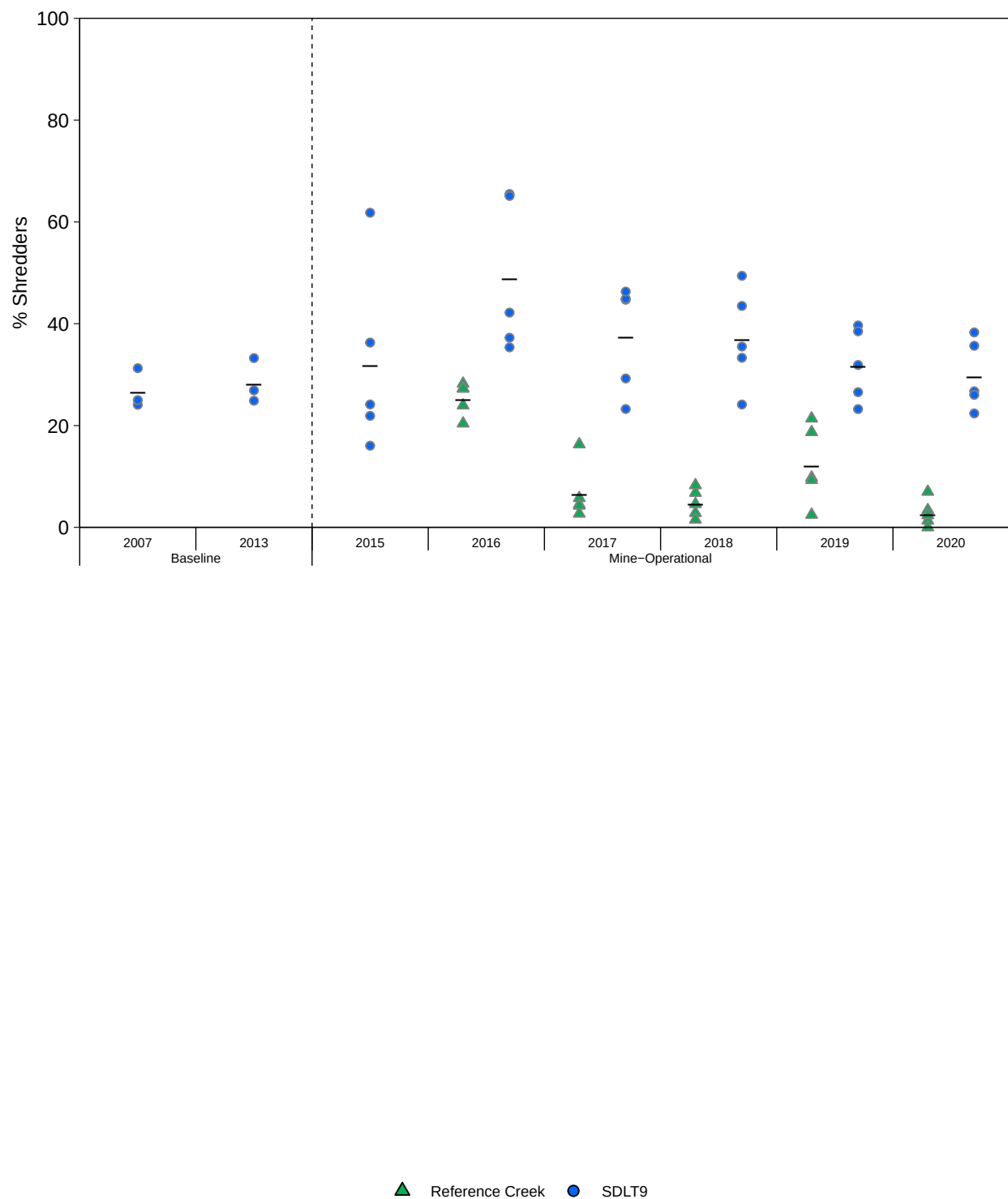


**Figure F.9: Temporal Comparison of Benthic Endpoints at SDLT9 Over Mine Baseline (2007 to 2013) and Operations (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

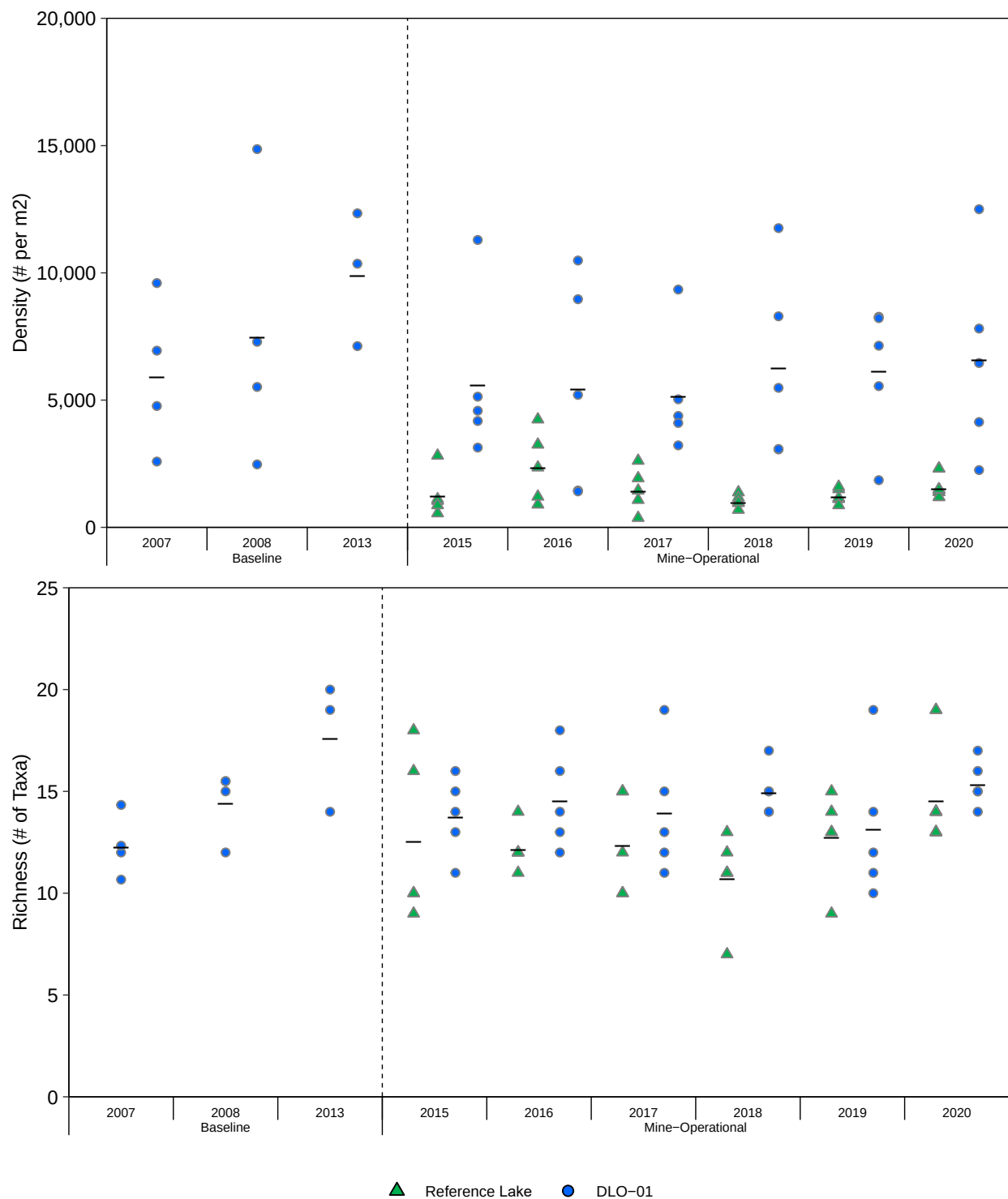


**Figure F.10: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-01) Littoral Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



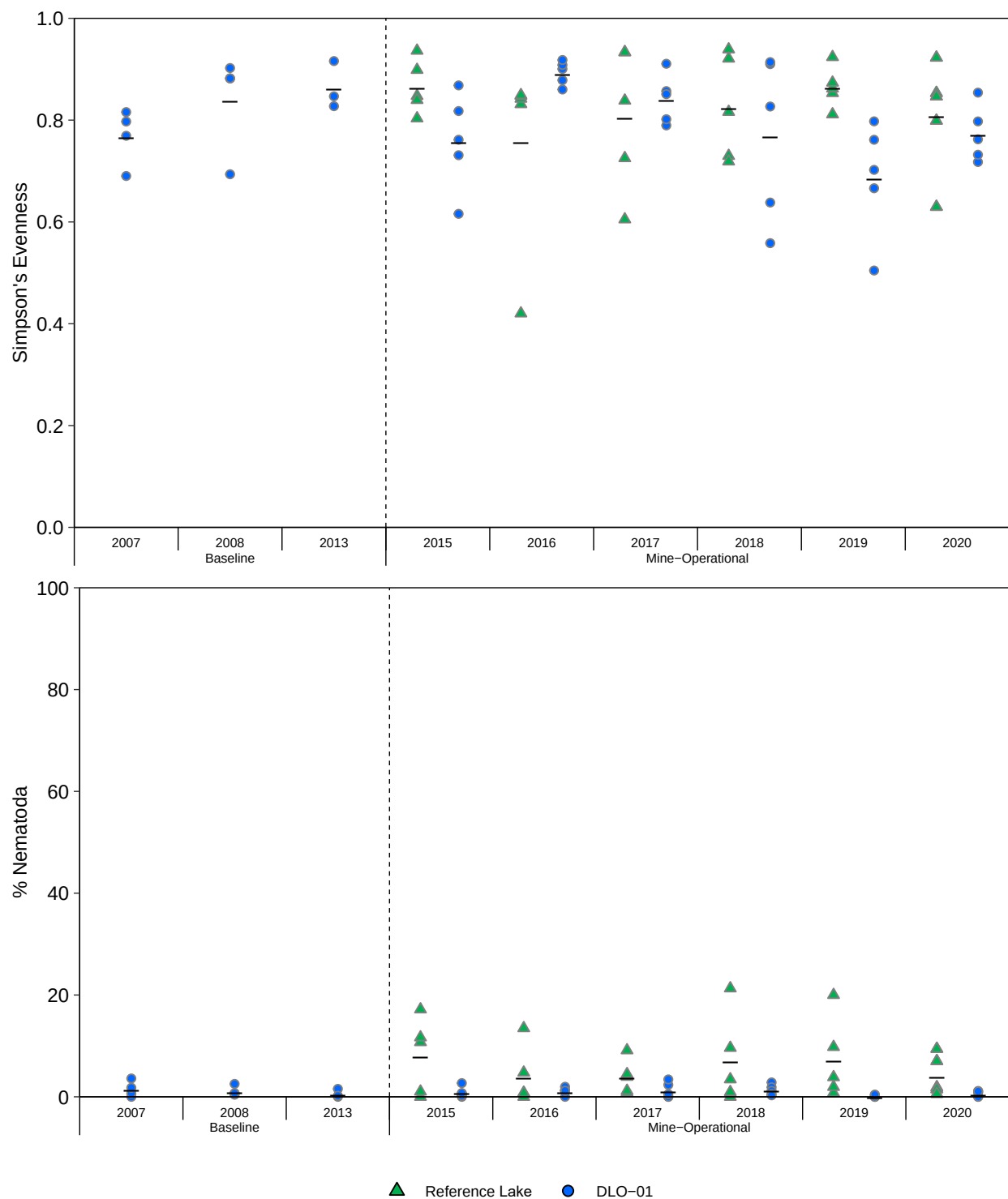


**Figure F.10: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-1) Littoral Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

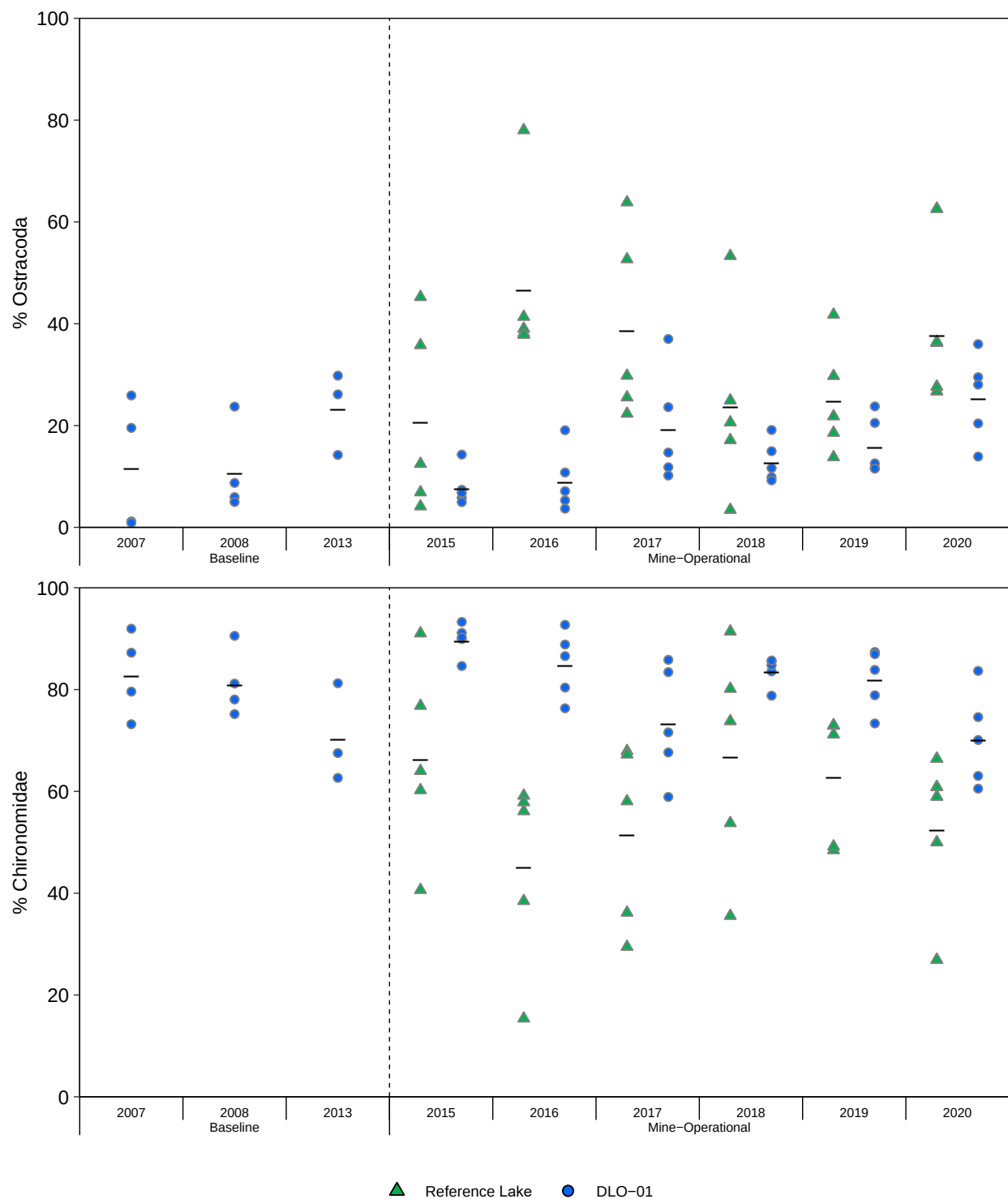


**Figure F.10: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-1) Littoral Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

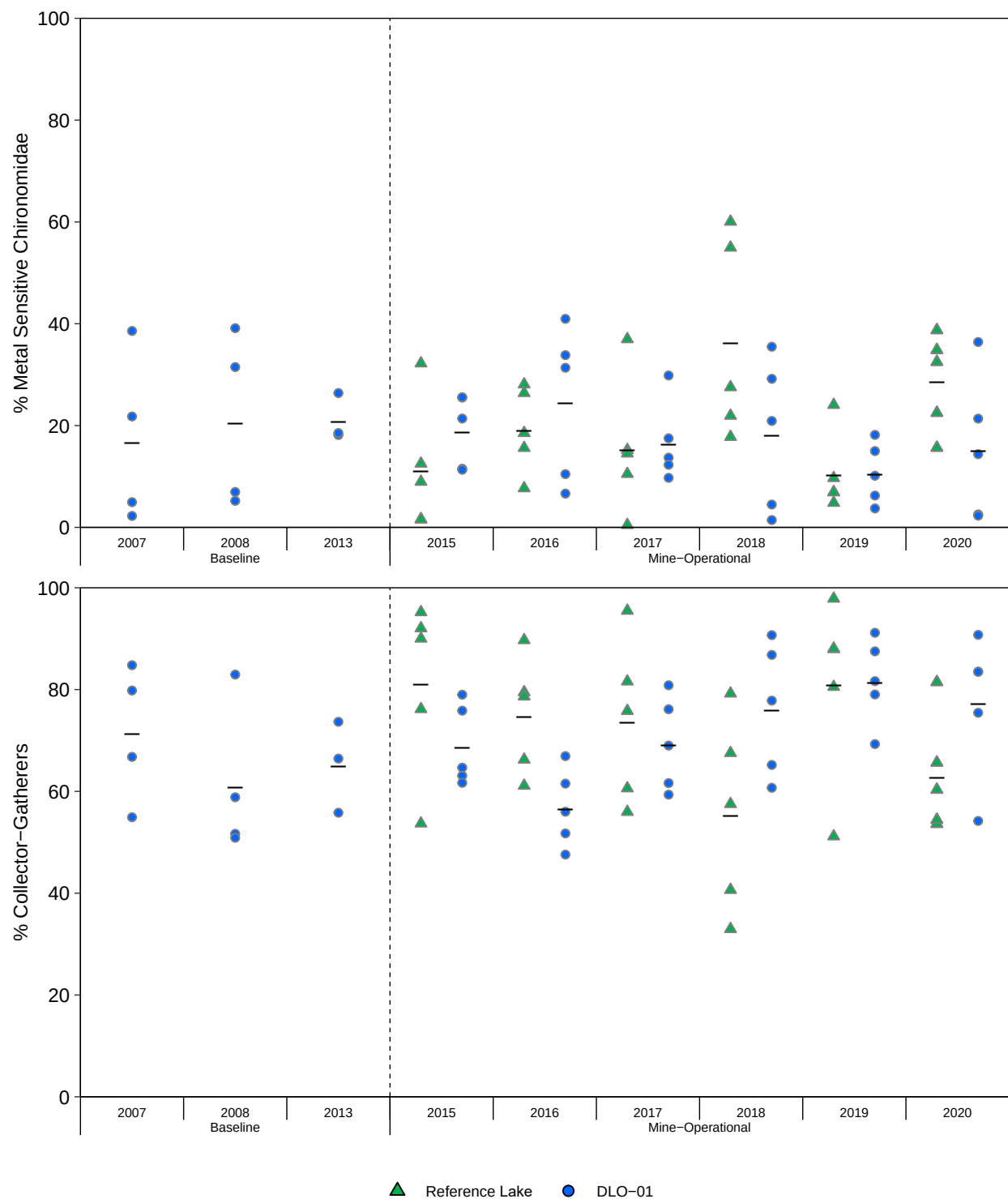


**Figure F.10: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-01) Littoral Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

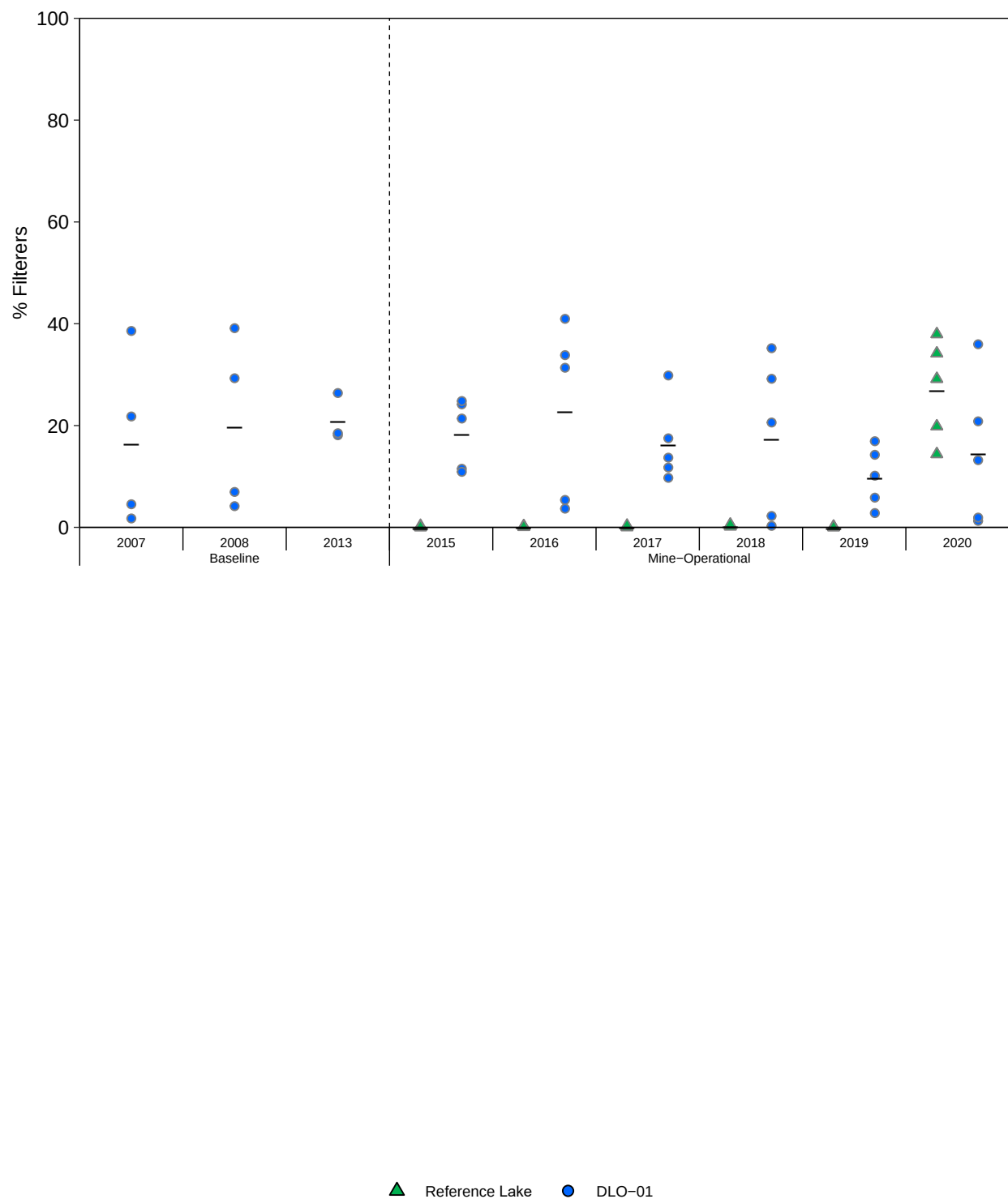


**Figure F.10: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-1) Littoral Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

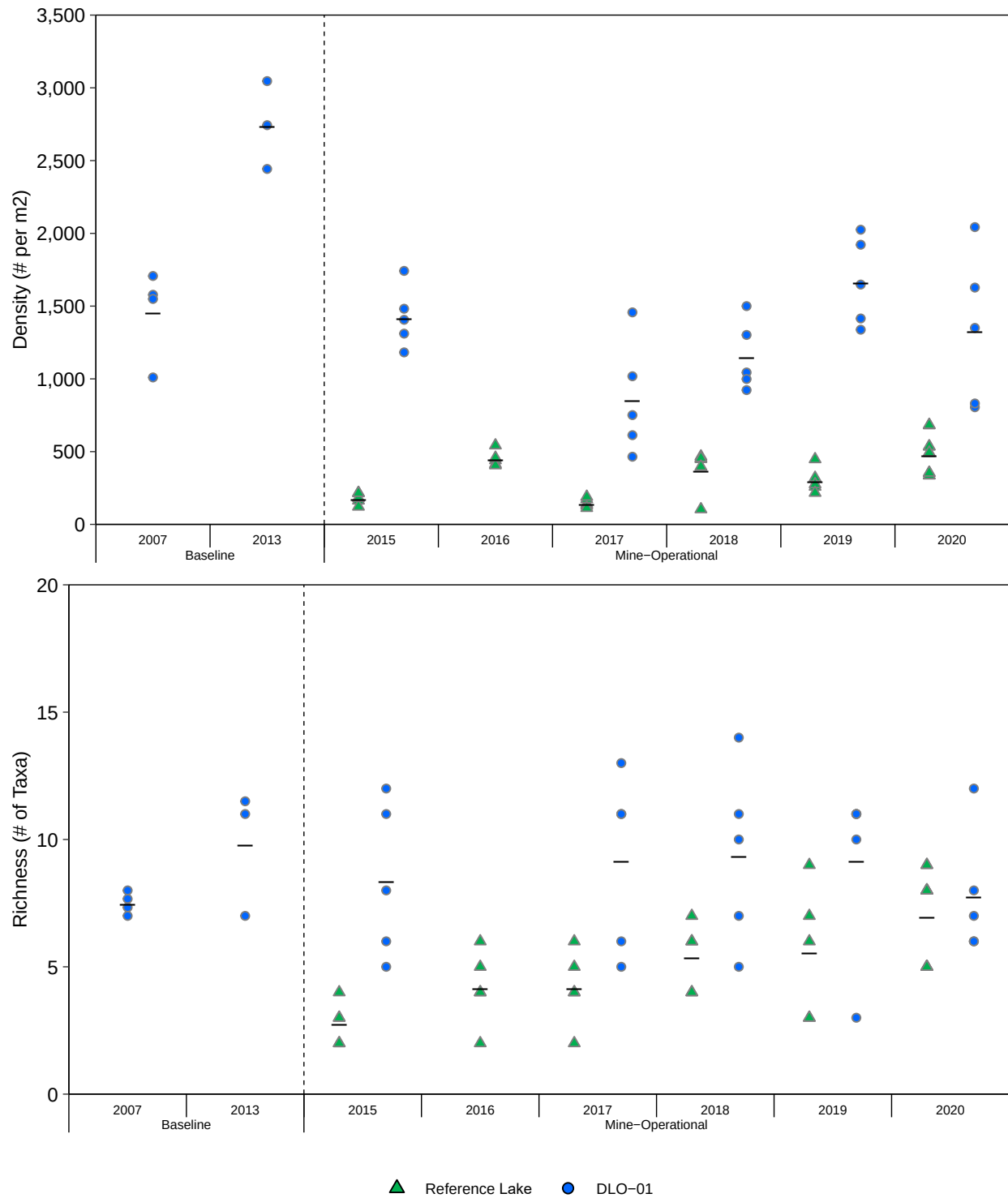


**Figure F.11: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-01) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

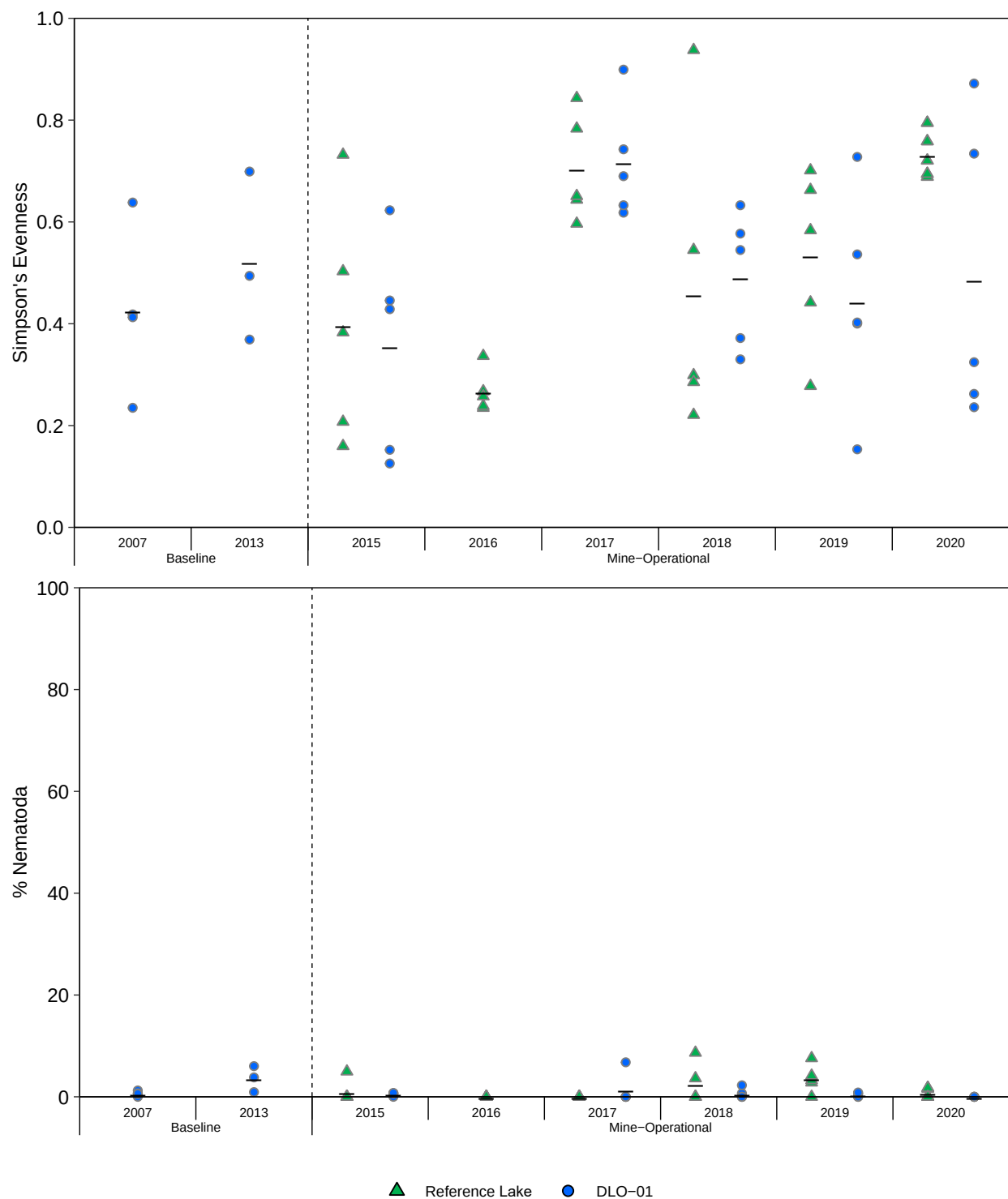


**Figure F.11: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DL0-1) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

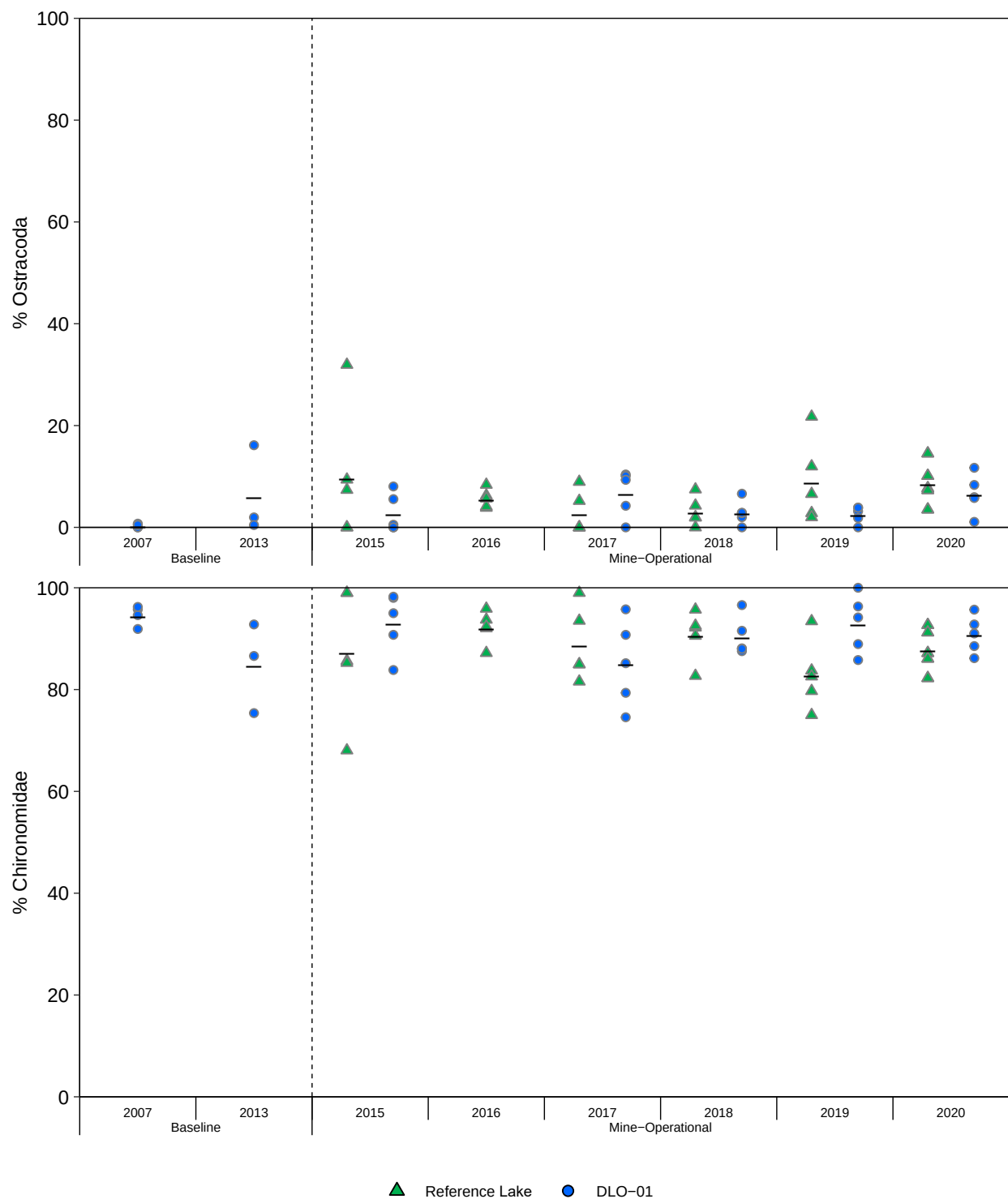


**Figure F.11: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-1) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

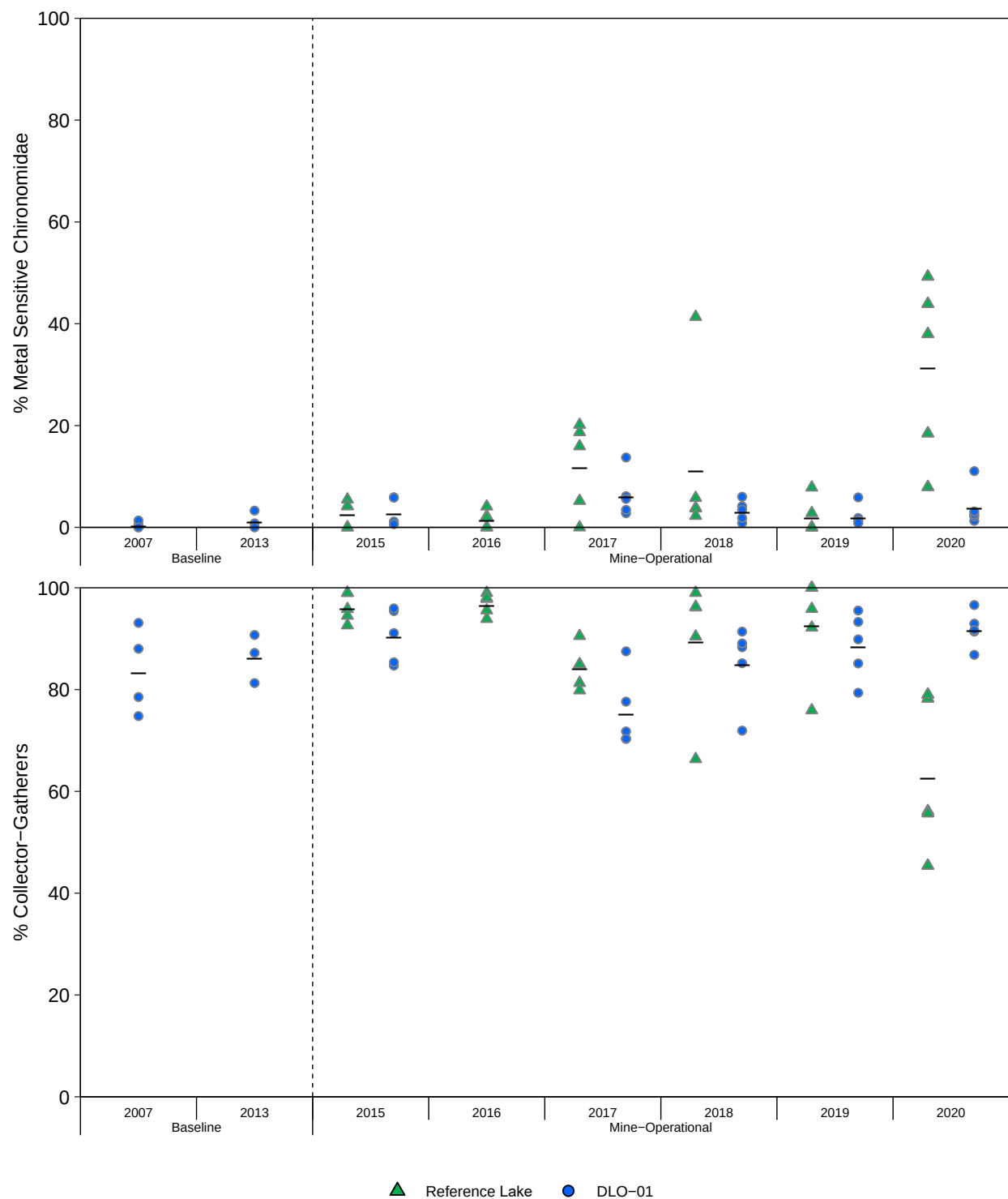


**Figure F.11: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DLO-1) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



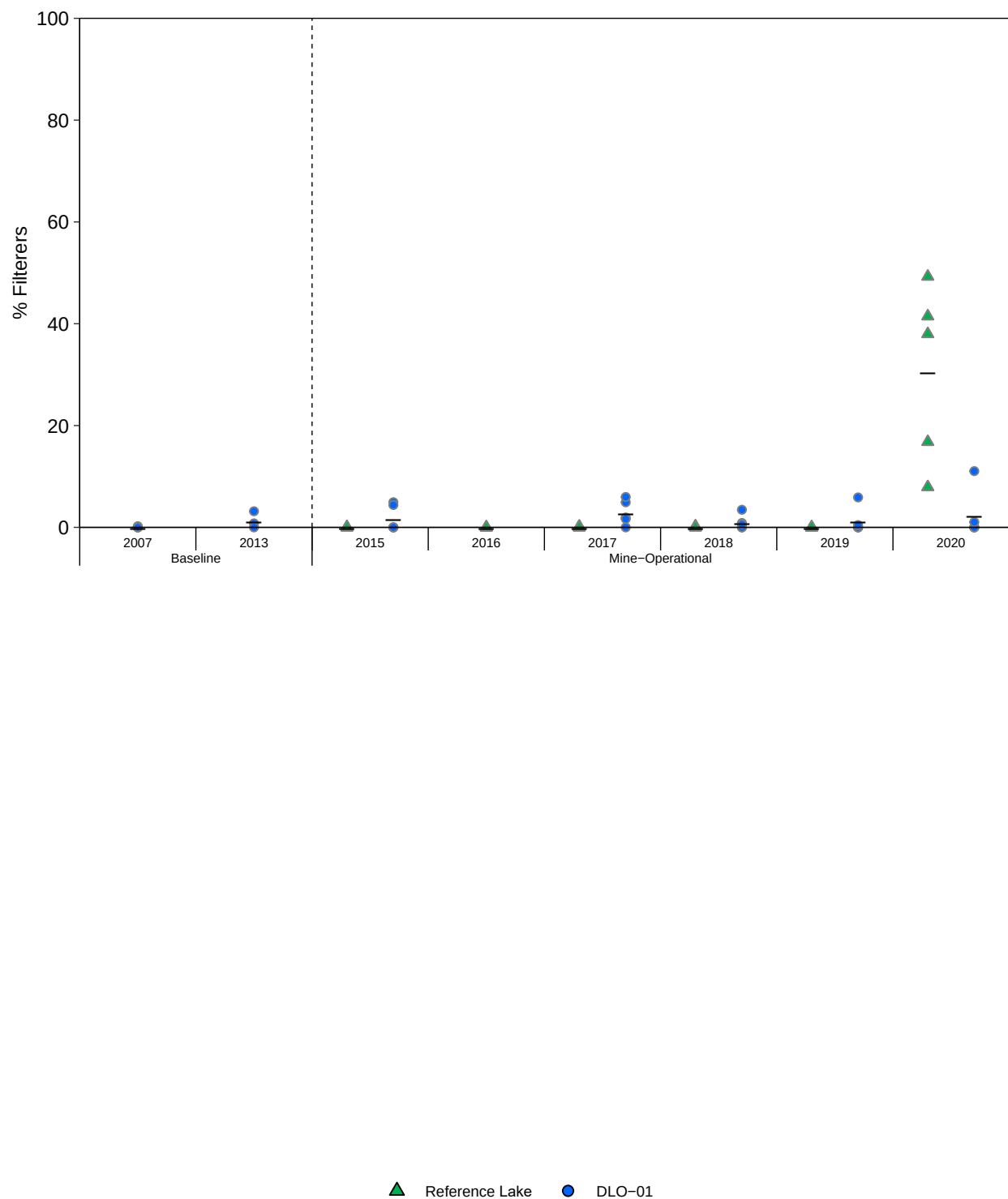


**Figure F.11: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake NW (DL0-1) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

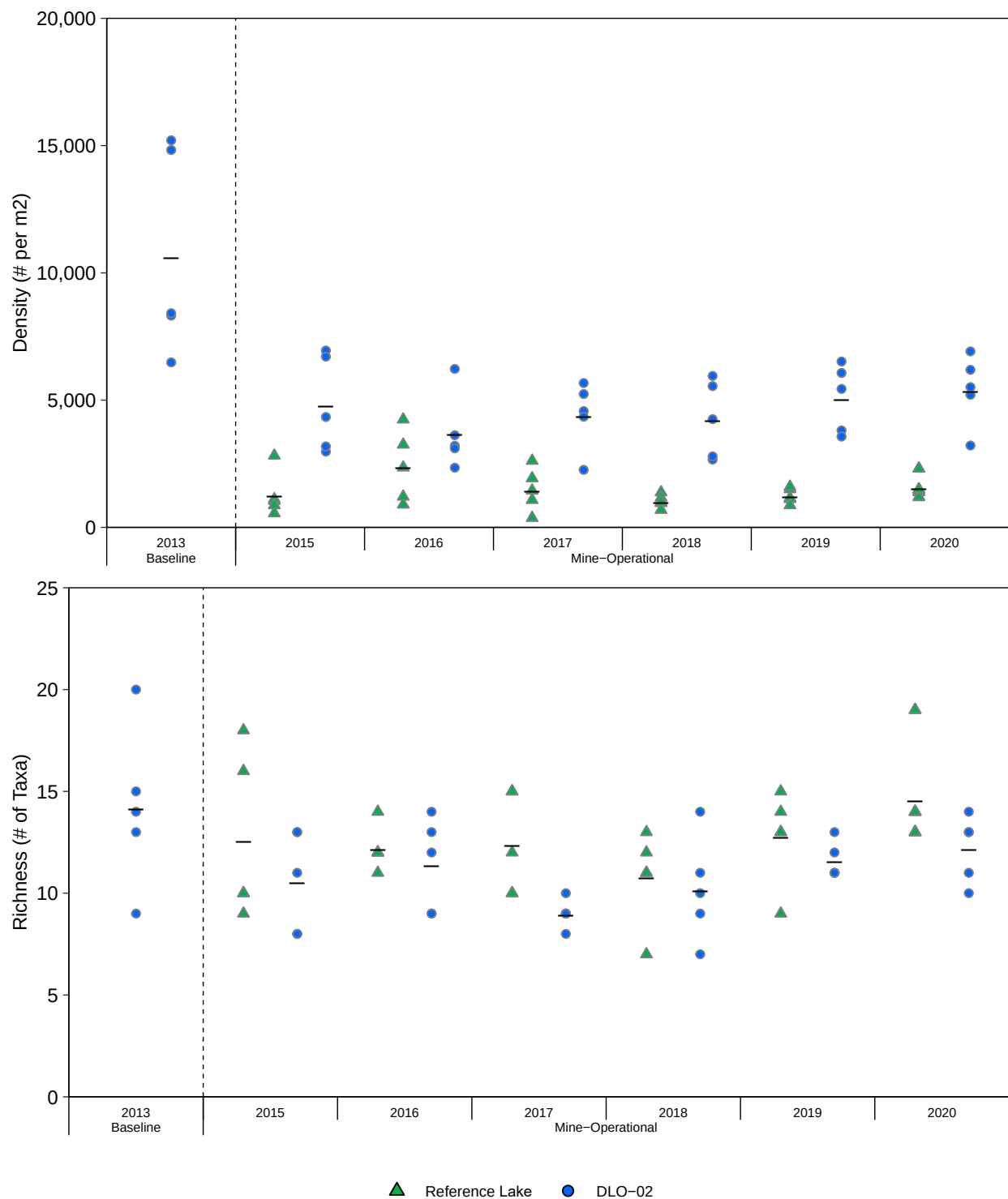


**Figure F.12: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DLO-2) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

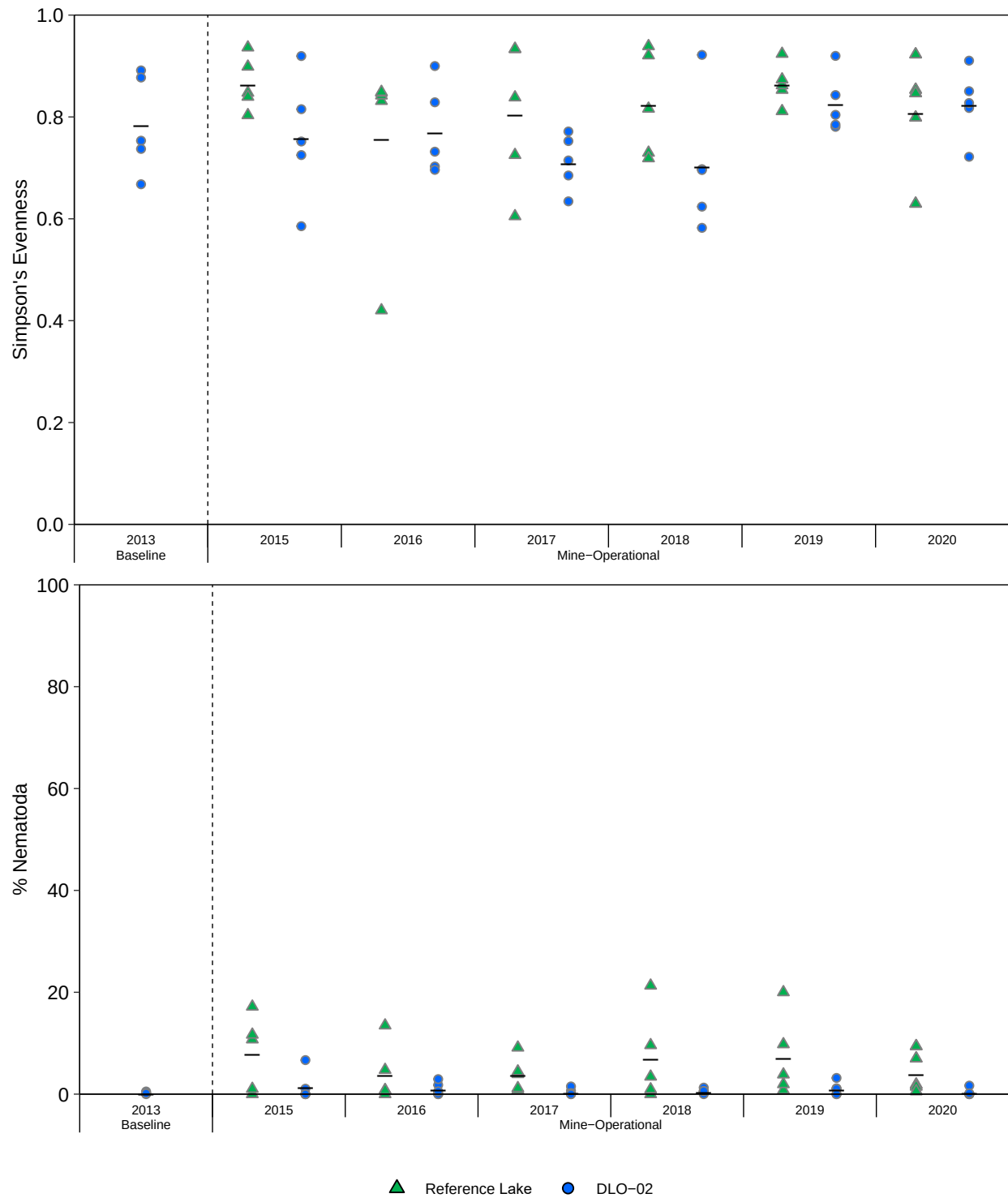


**Figure F.12: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DL0-2) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

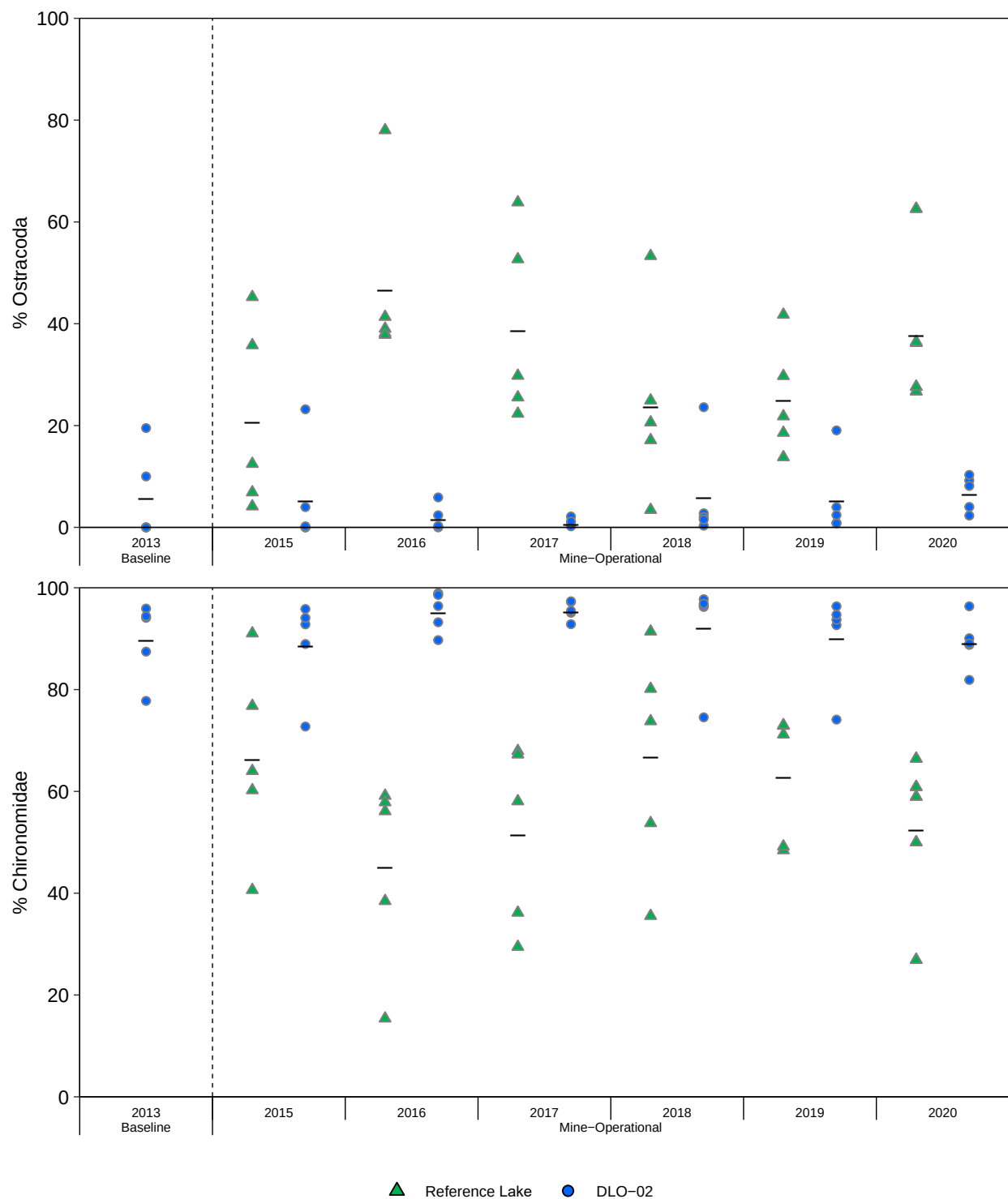


**Figure F.12: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DLO-2) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

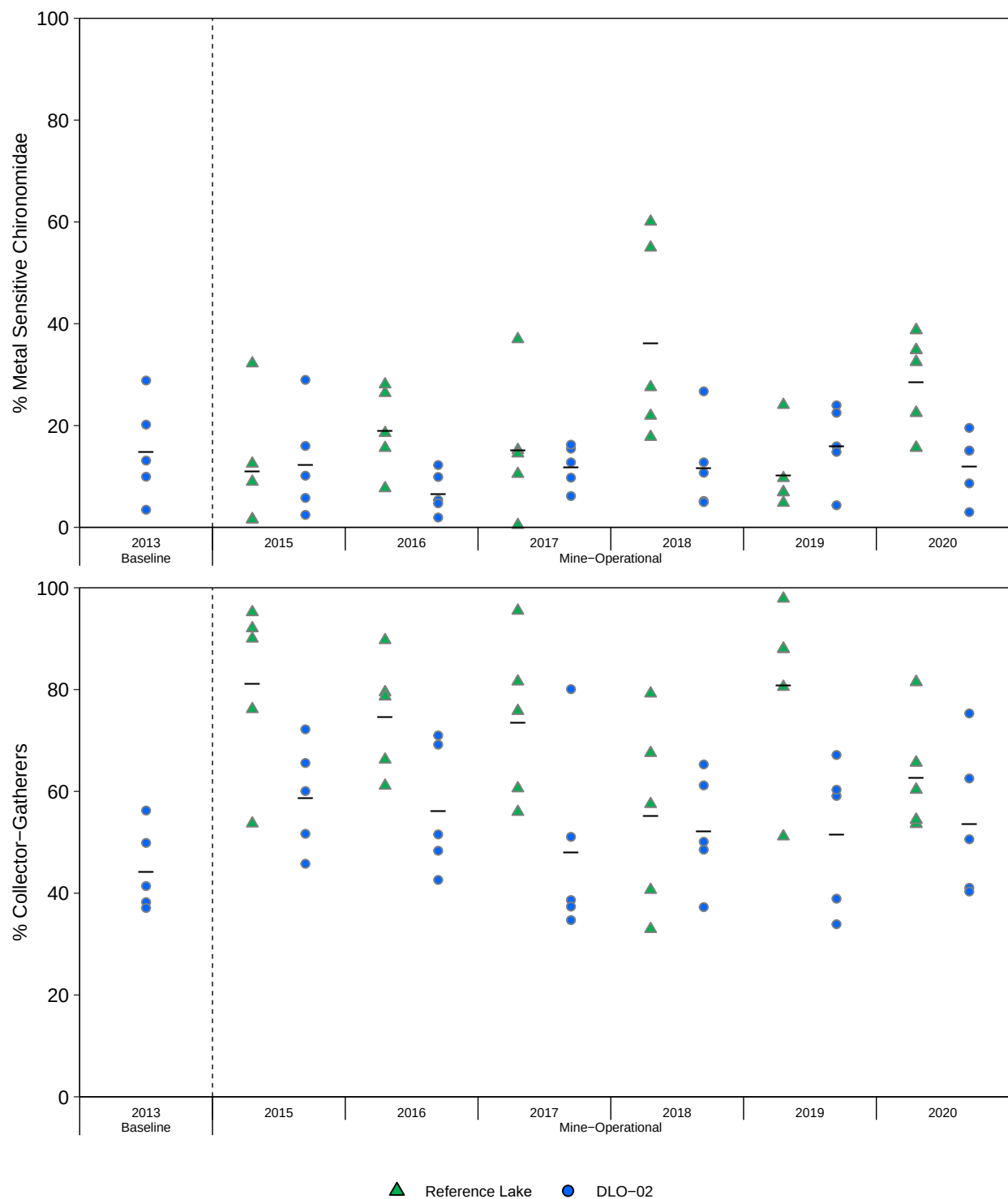


**Figure F.12: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DLO-2) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

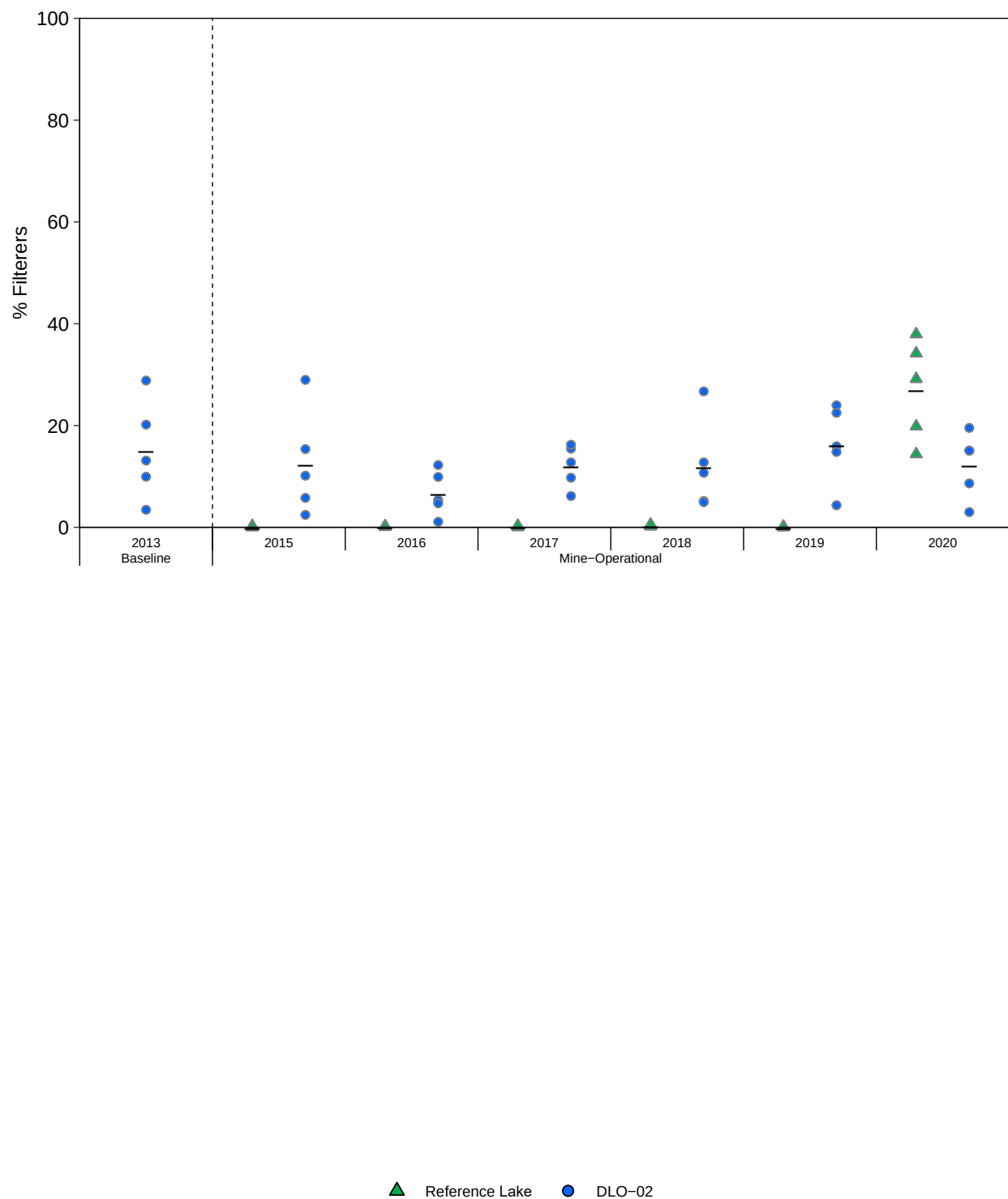


**Figure F.12: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DLO-2) Littoral Habitat Stations among Mine Baseline (2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

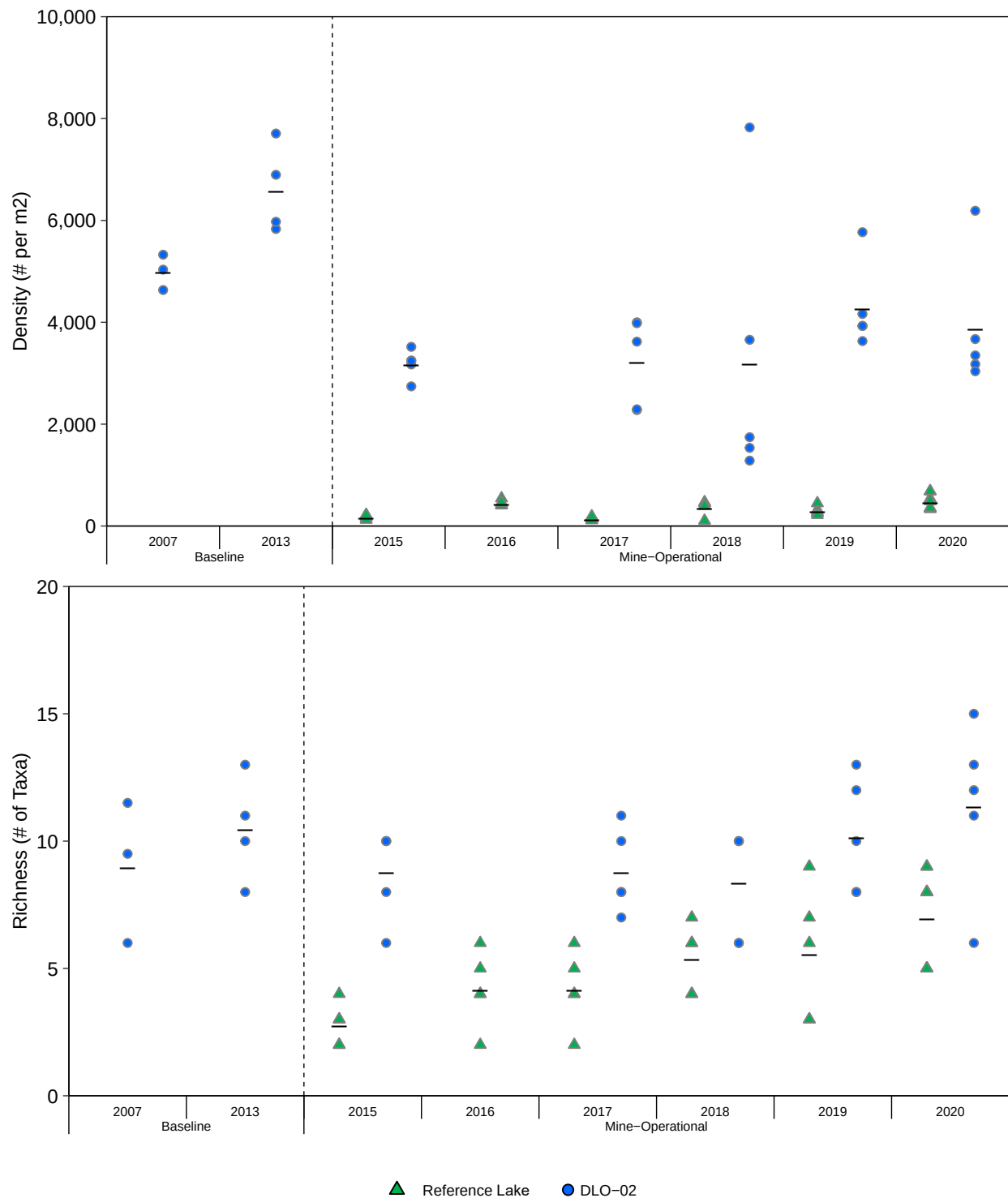


**Figure F.13: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DL0-2) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

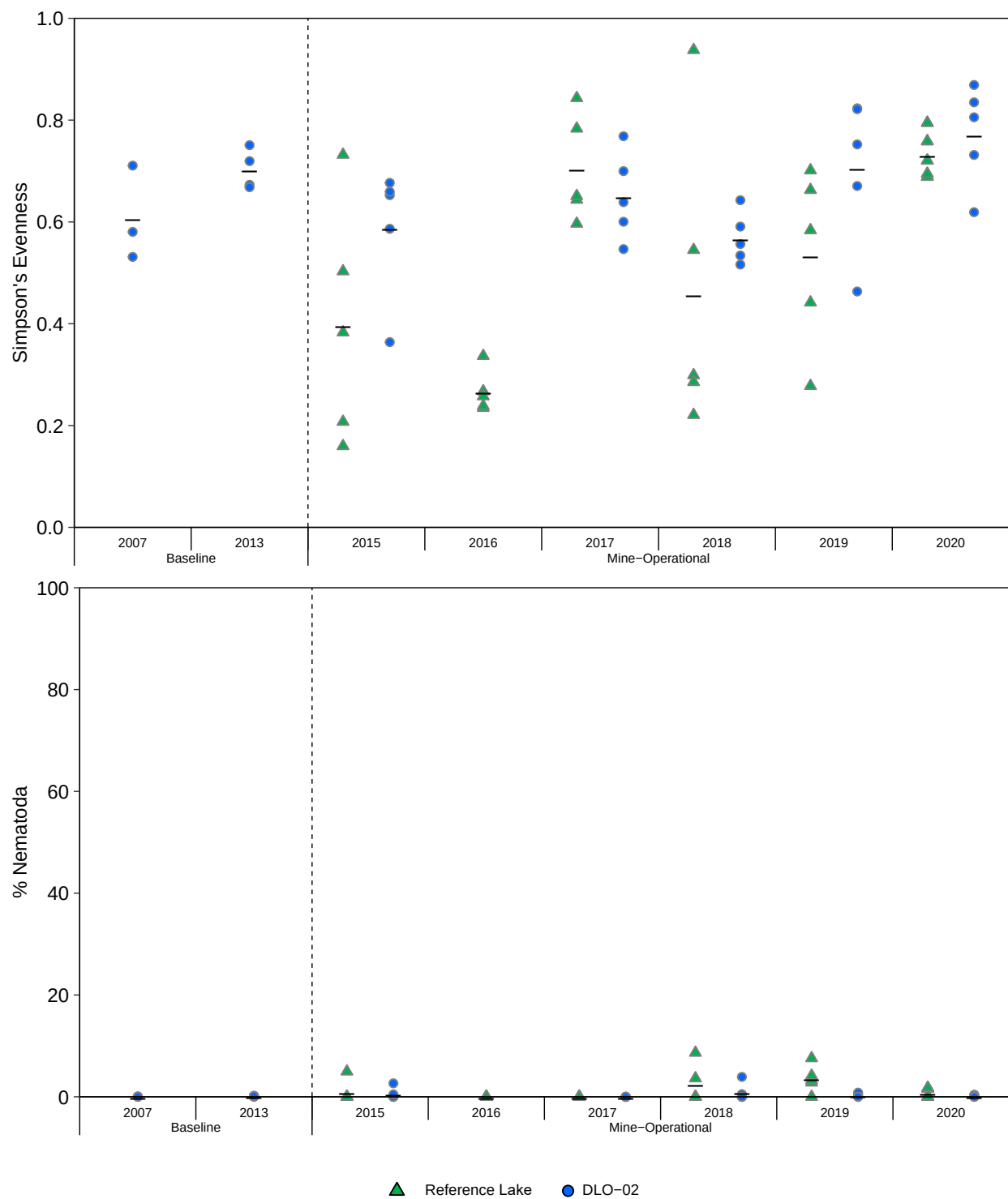


**Figure F.13: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DL0-2) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



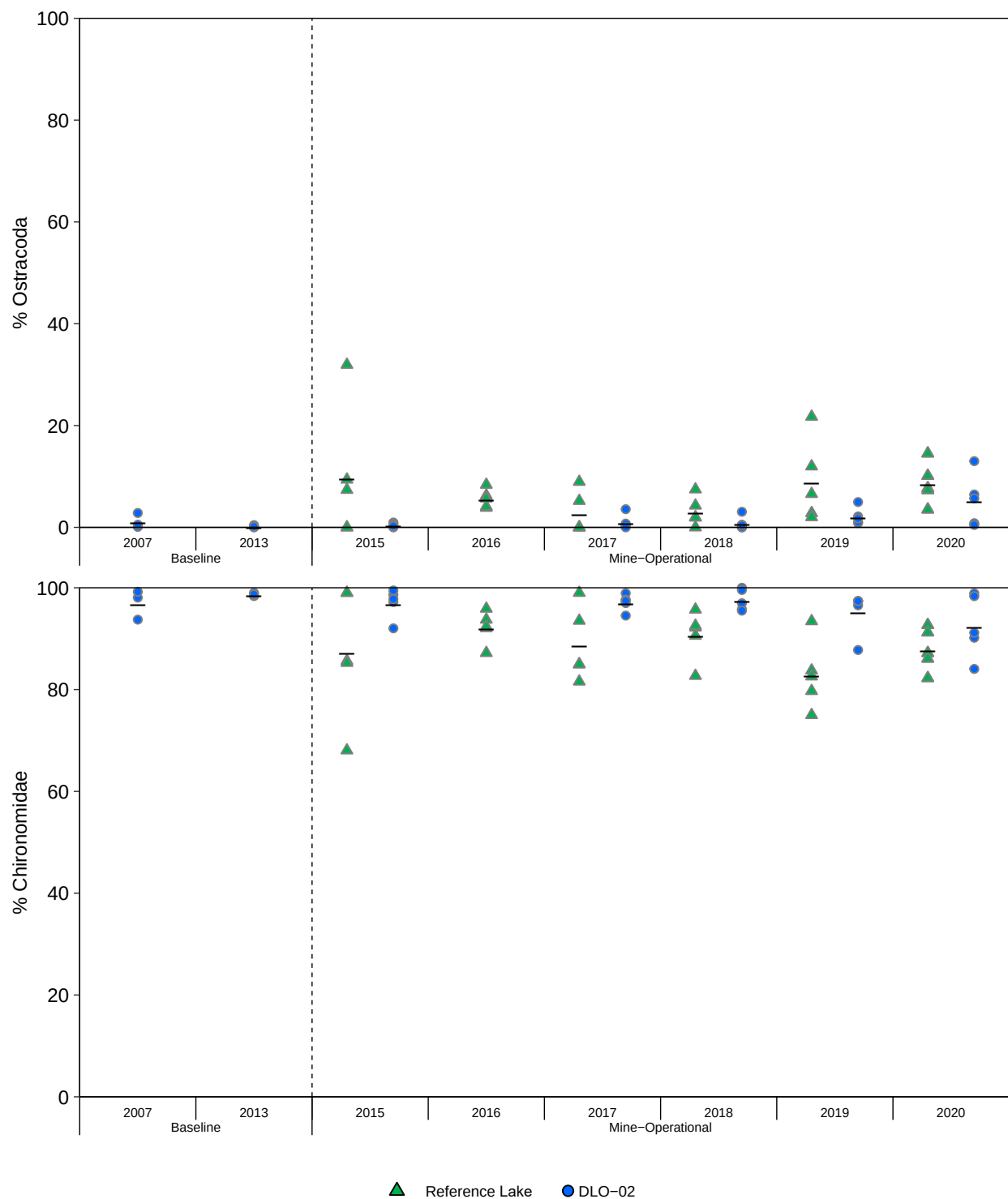


**Figure F.13: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DL0-2) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

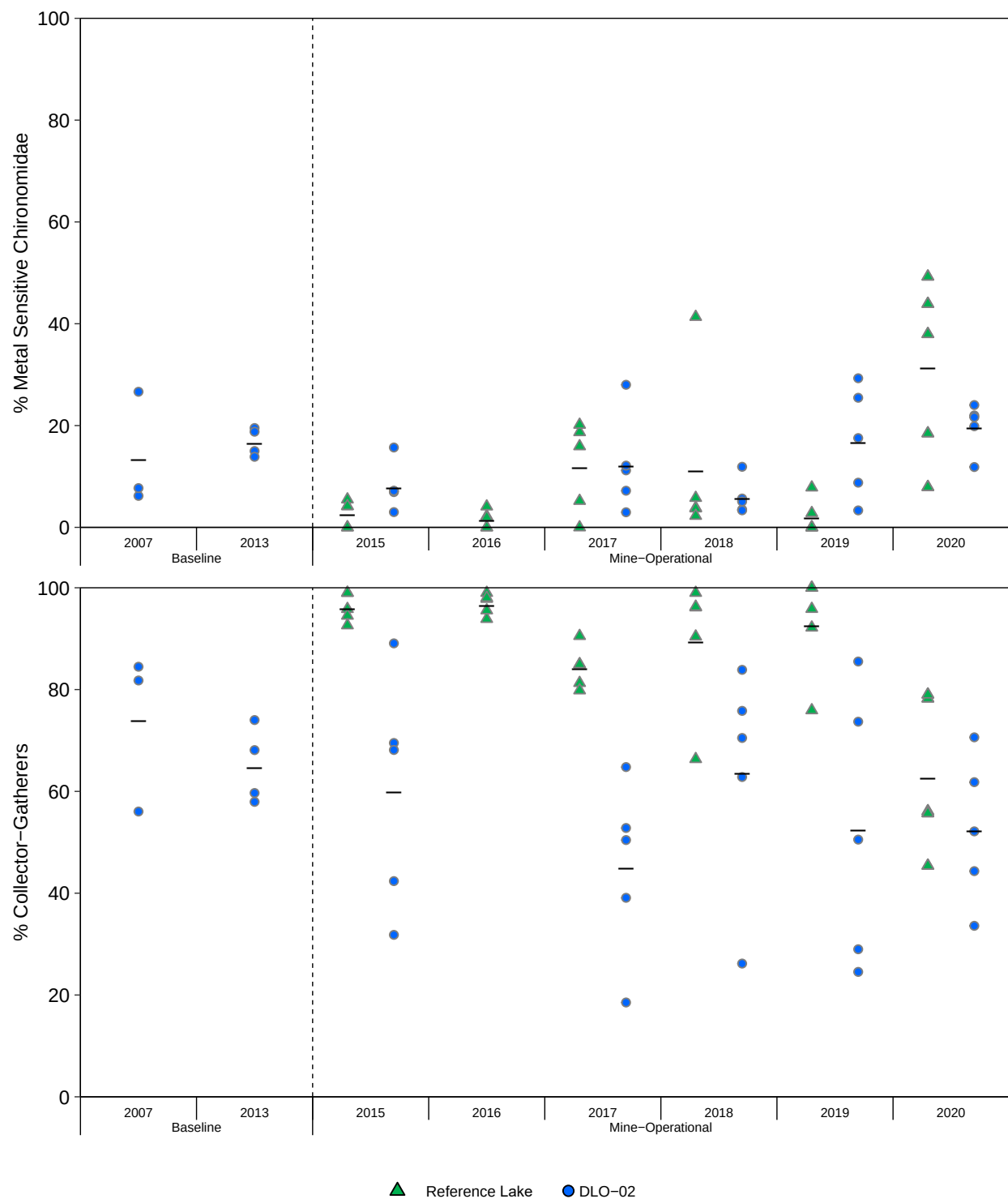


**Figure F.13: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DL0-2) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

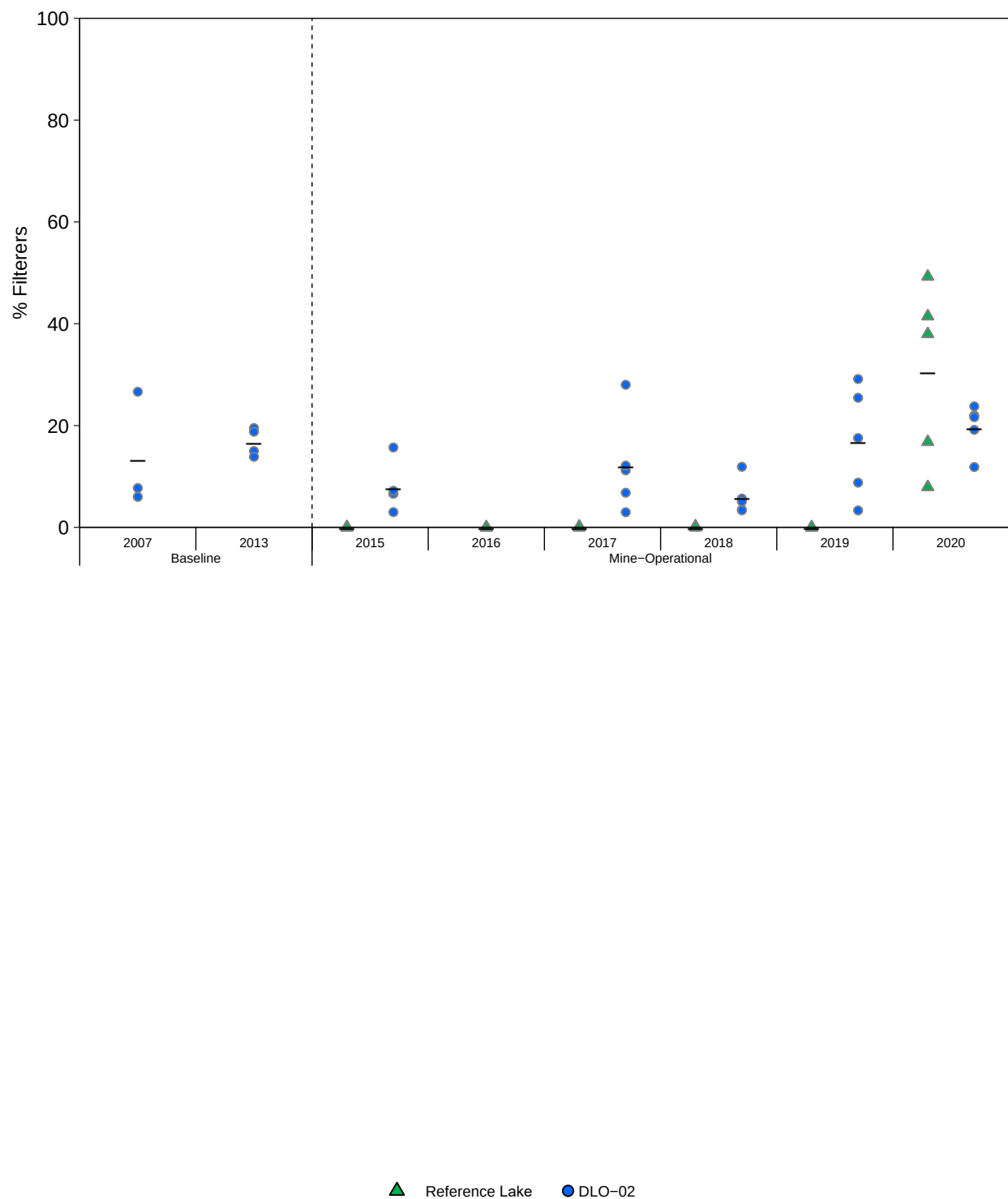


**Figure F.13: Comparison of Key Benthic Invertebrate Community Metrics at Sheardown Lake SE (DLO-2) Profundal Habitat Stations among Mine Baseline (2007 to 2013) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

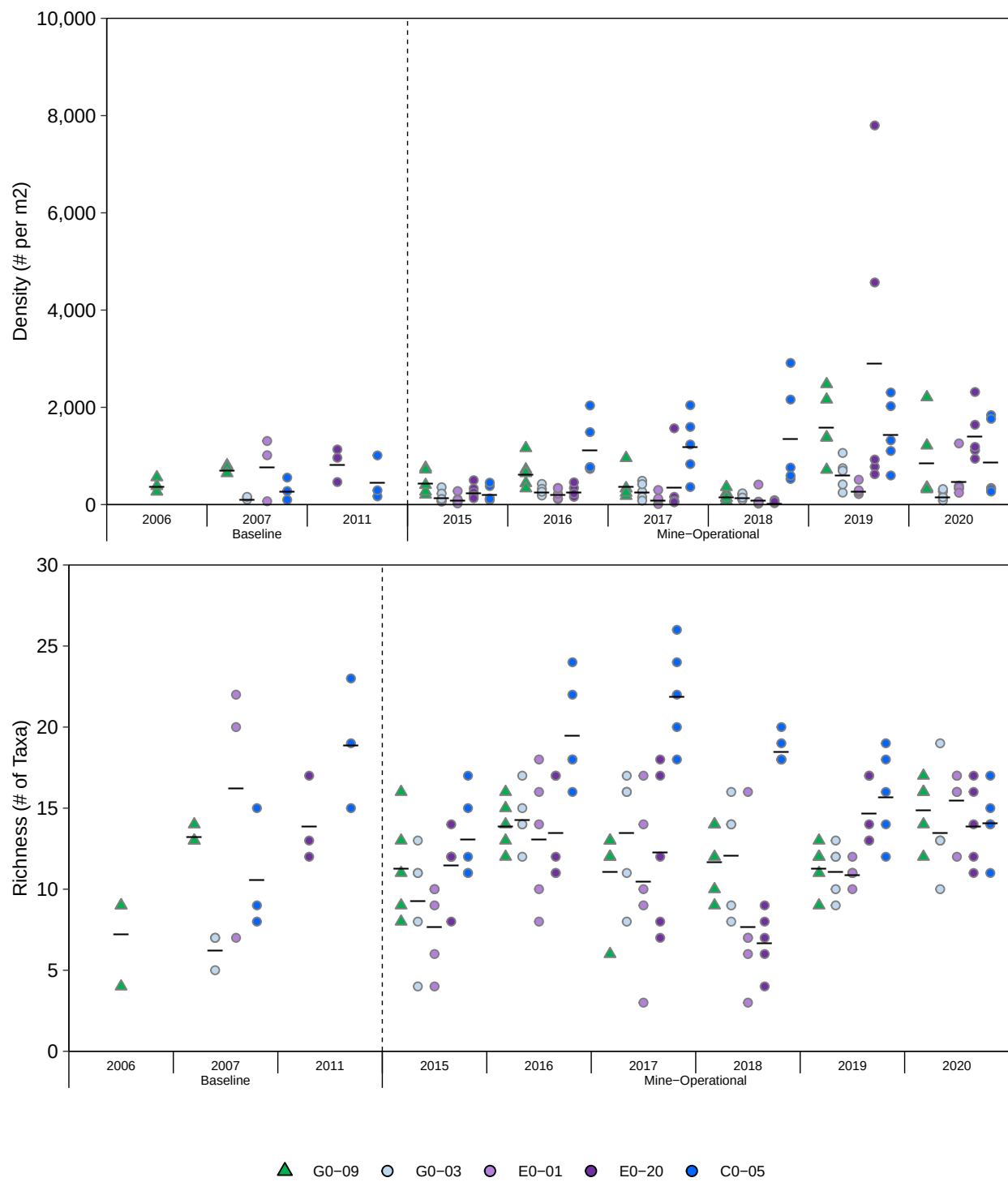


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

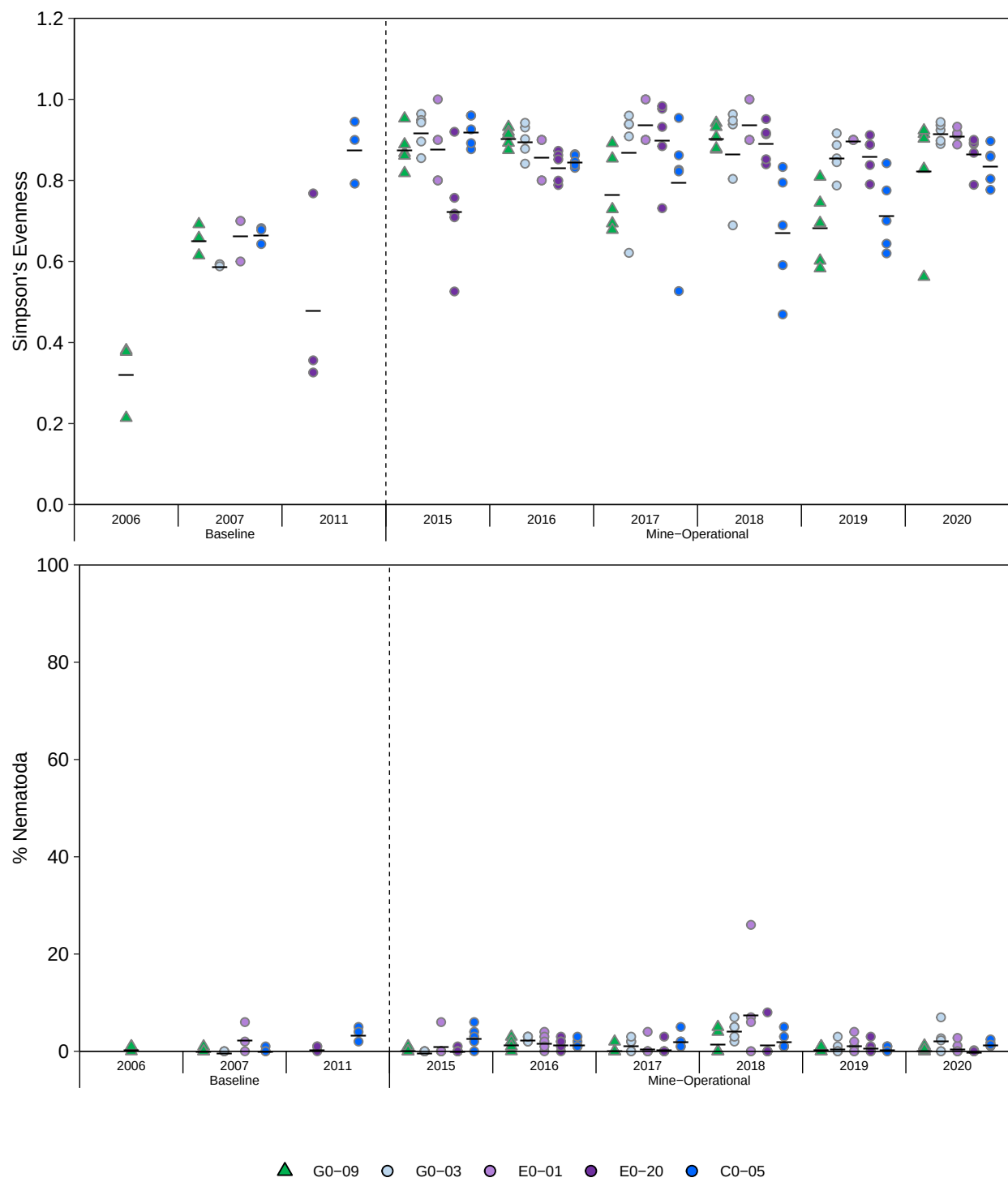


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

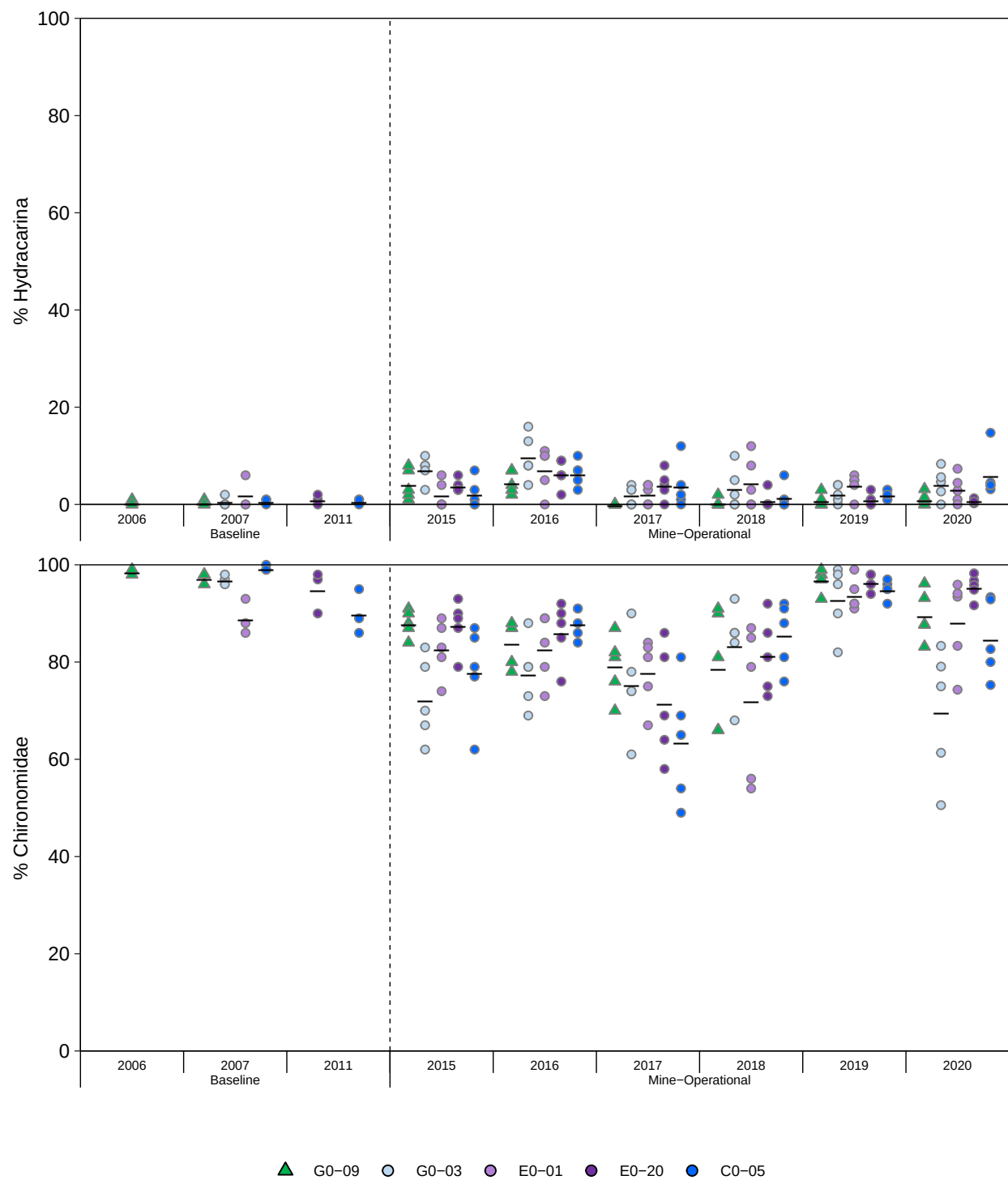


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

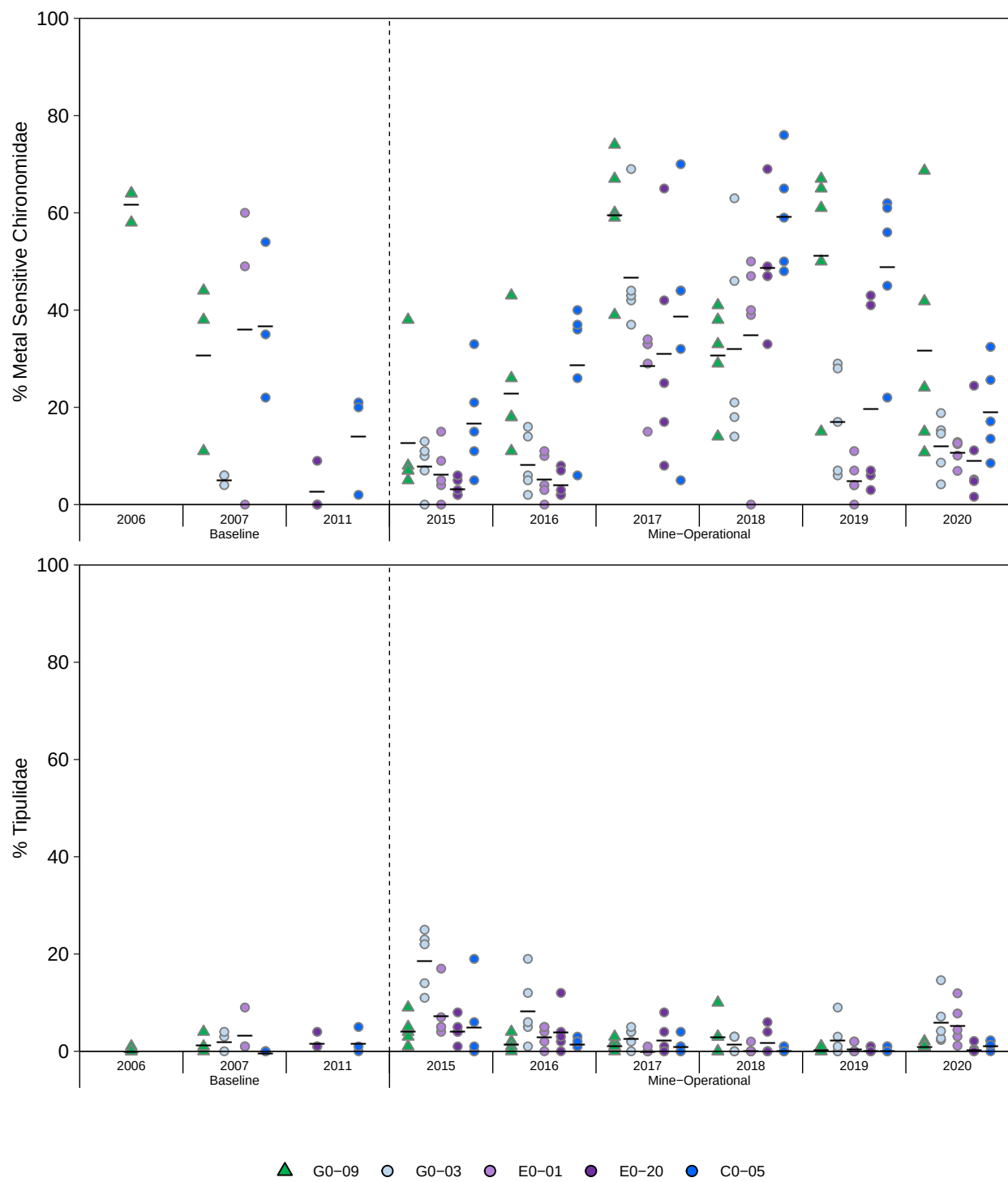


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

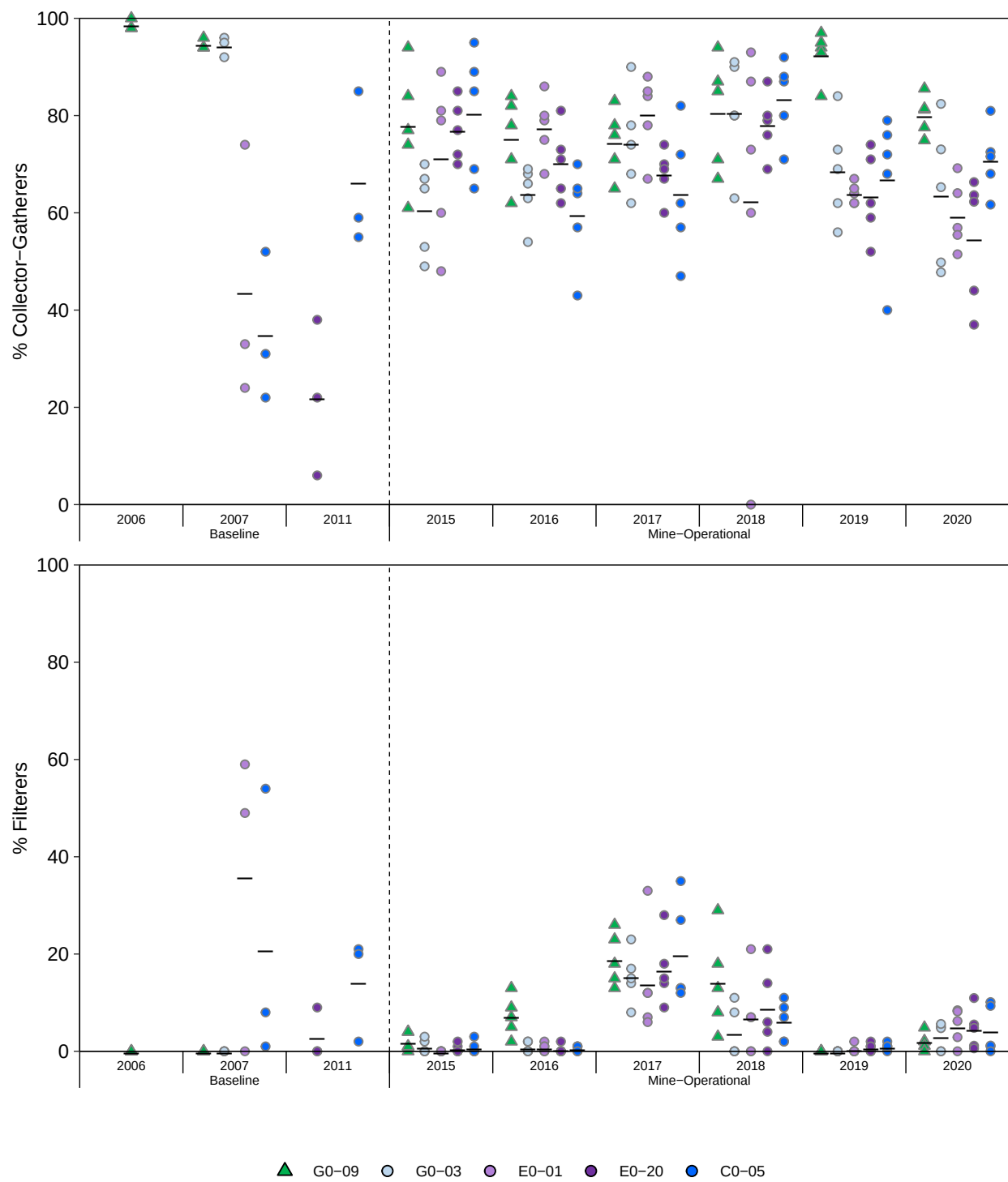


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



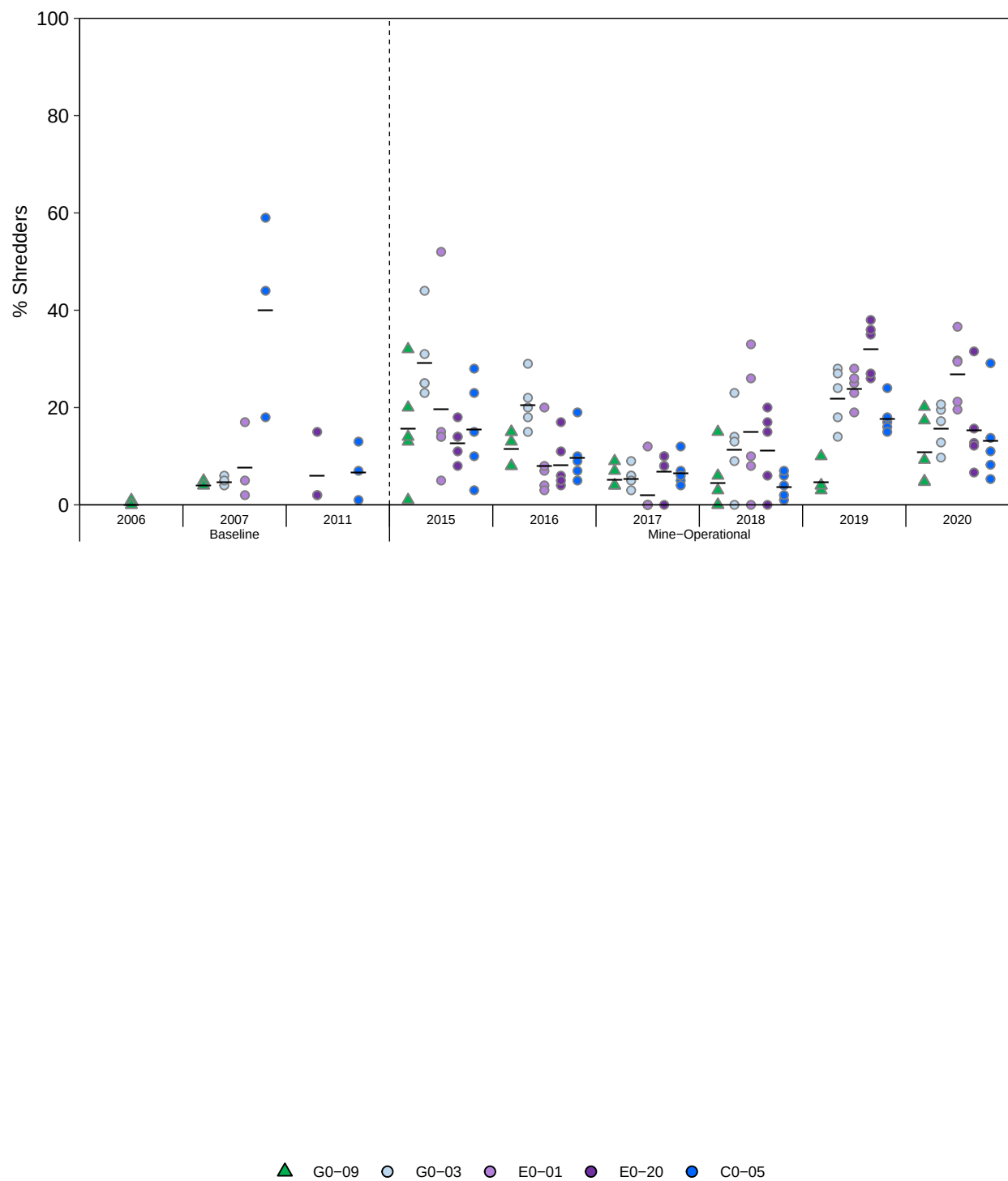


**Figure F.14: Comparison of Key Benthic Invertebrate Community Metrics at Mary River Upstream (G0-09) and Downstream (G0-03, E0-01, E0-20, C0-05) Stations among Mine Baseline (2006 to 2011) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

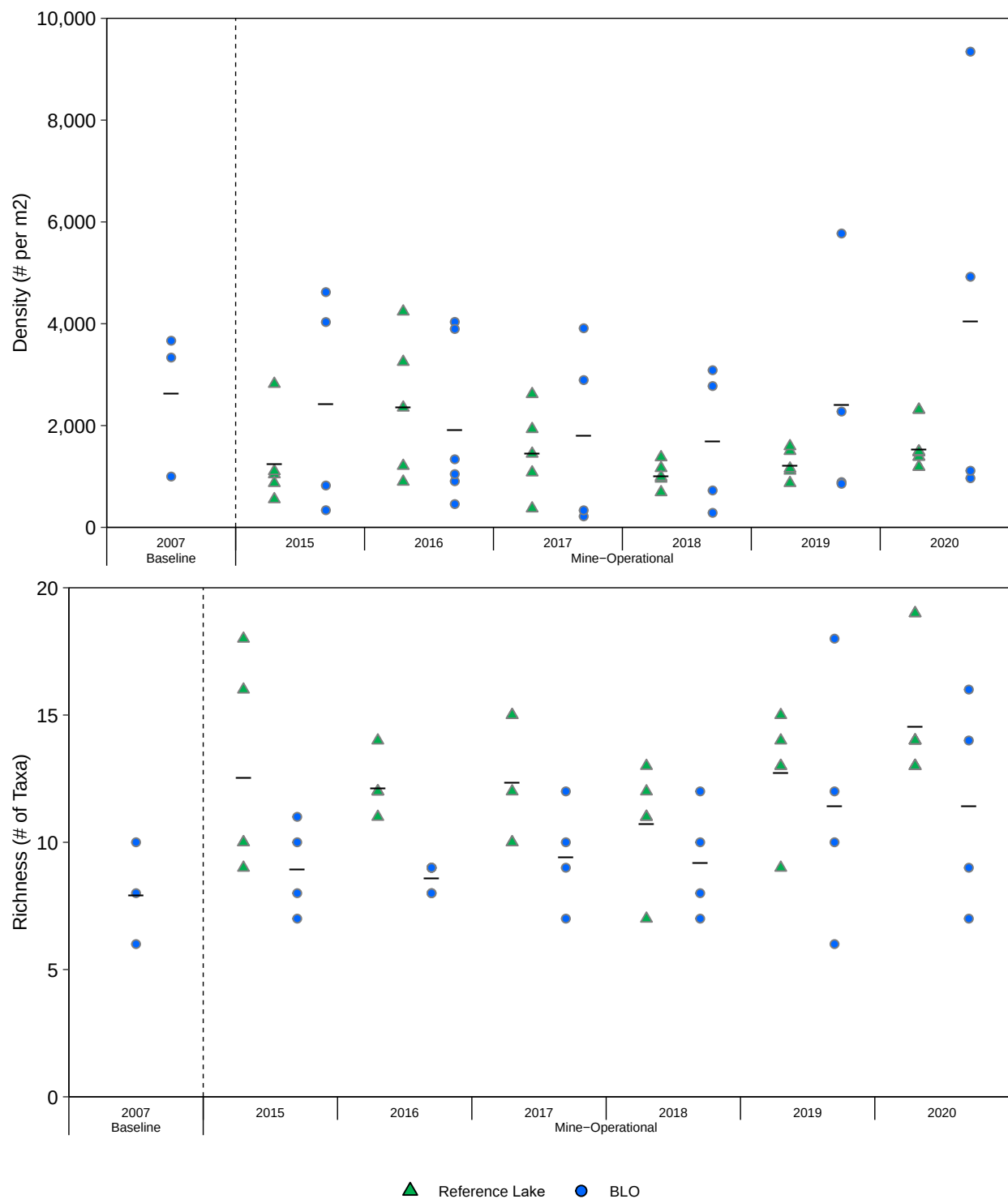


**Figure F.15: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Littoral Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

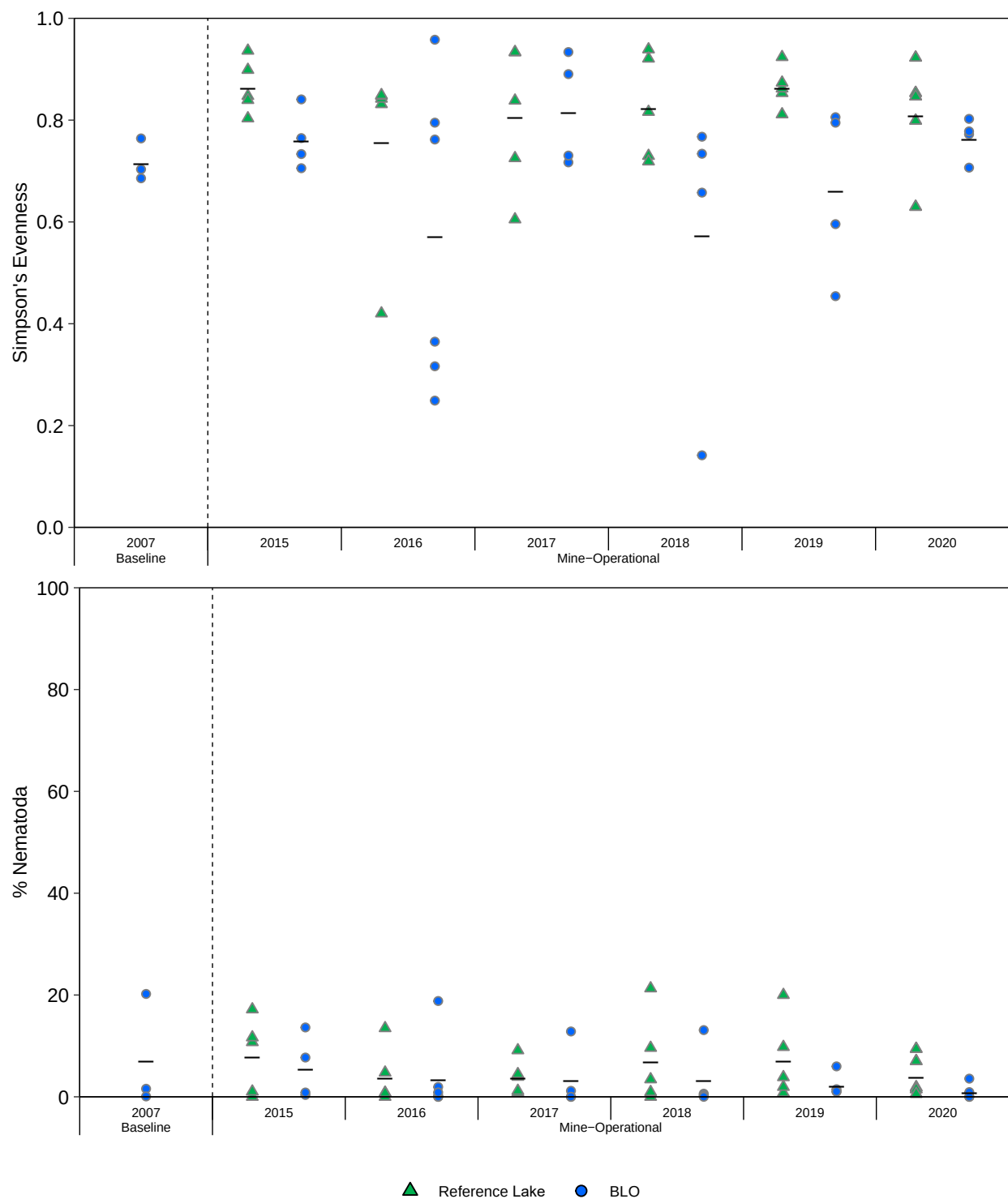


**Figure F.15: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Littoral Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

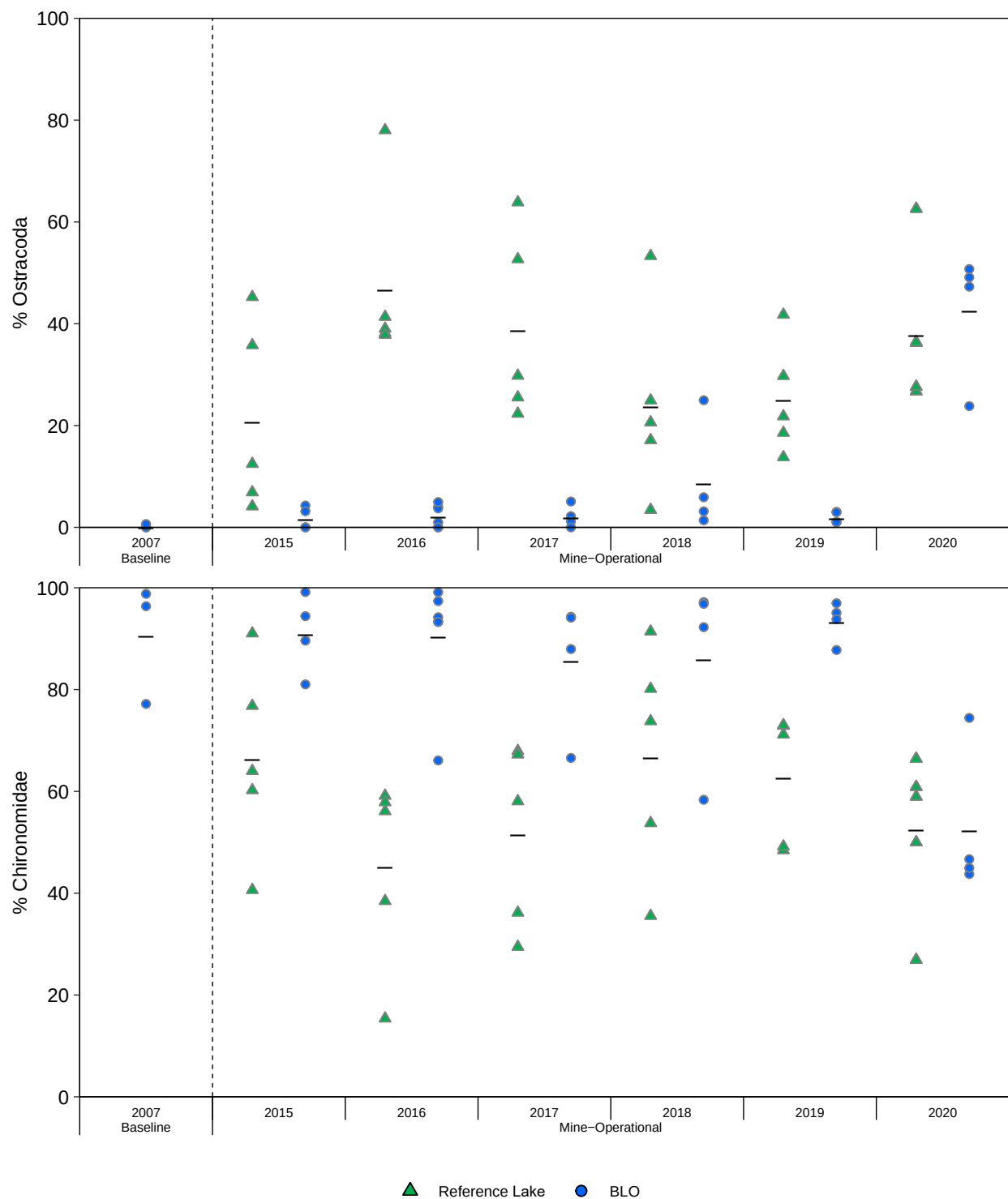


**Figure F.15: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Littoral Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

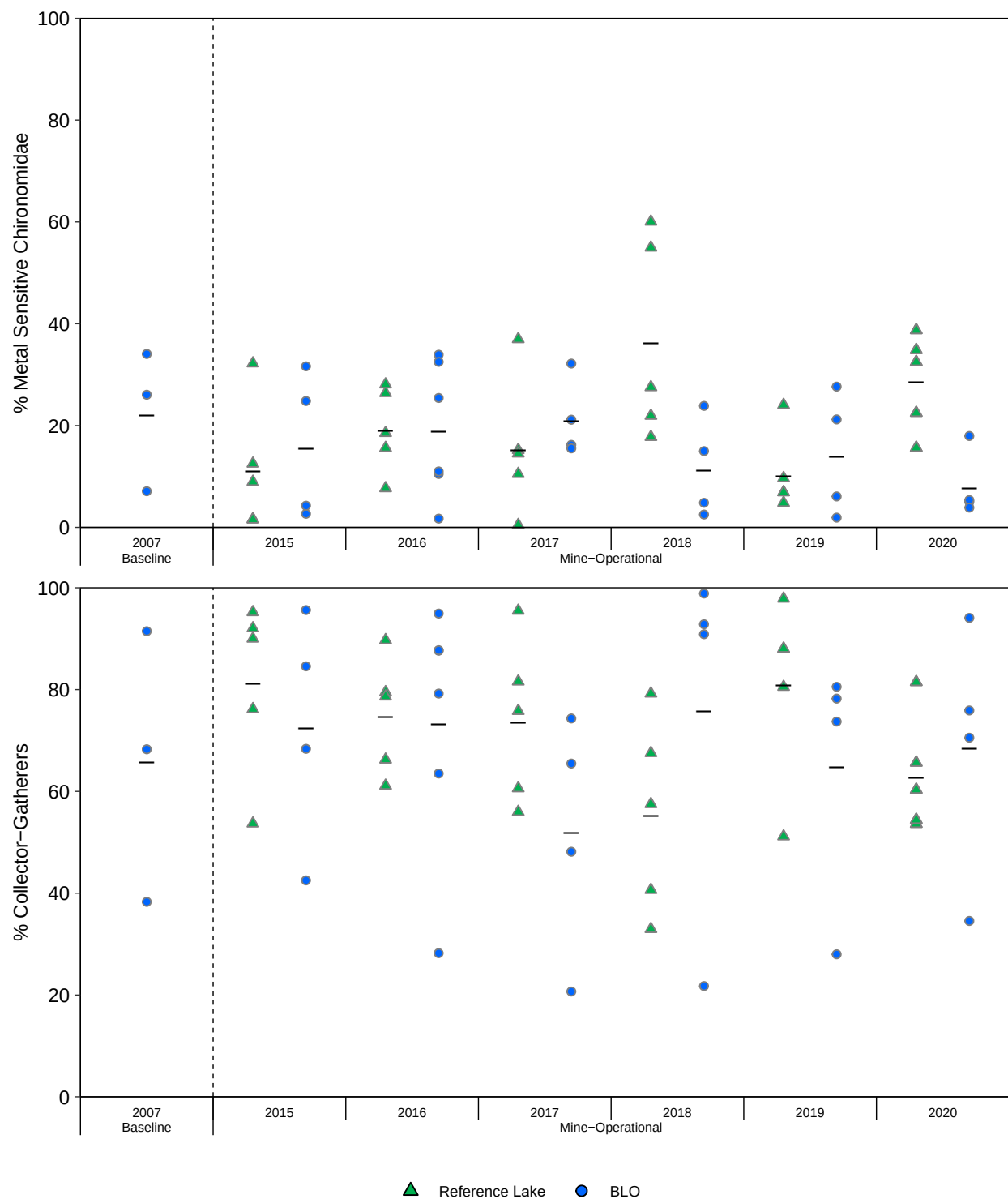


**Figure F.15: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Littoral Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

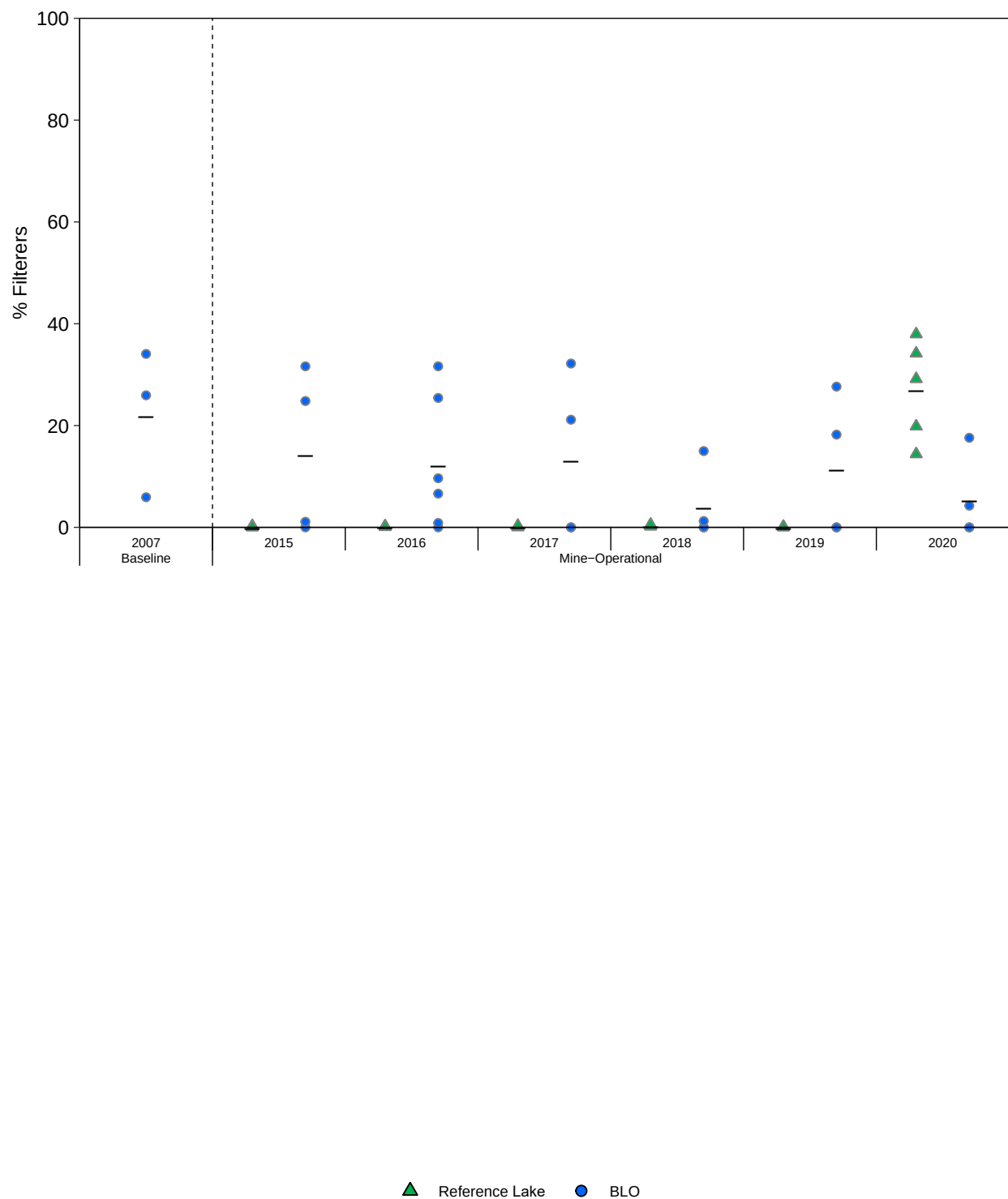


**Figure F.15: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Littoral Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

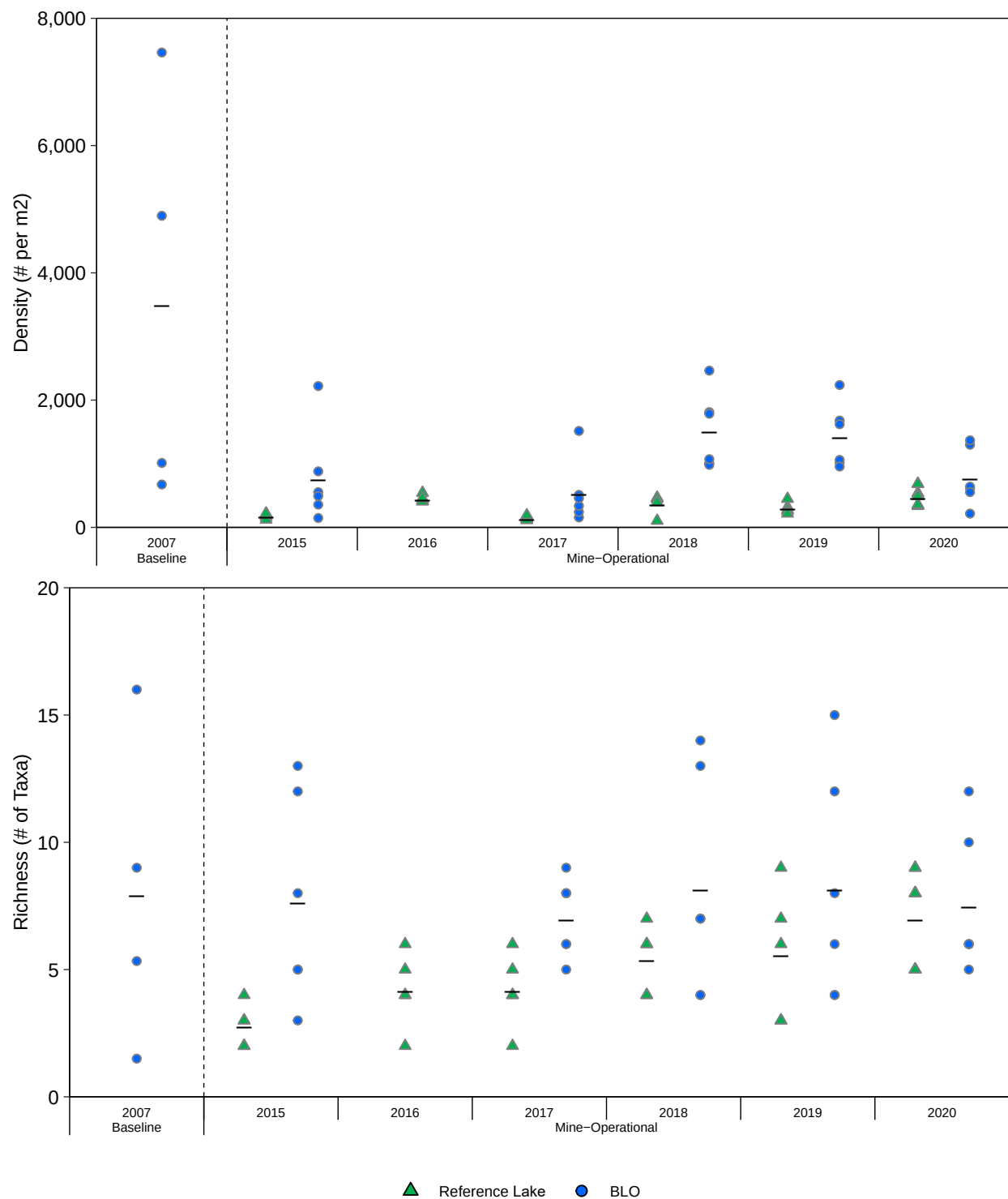


**Figure F.16: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BL0) Profundal Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

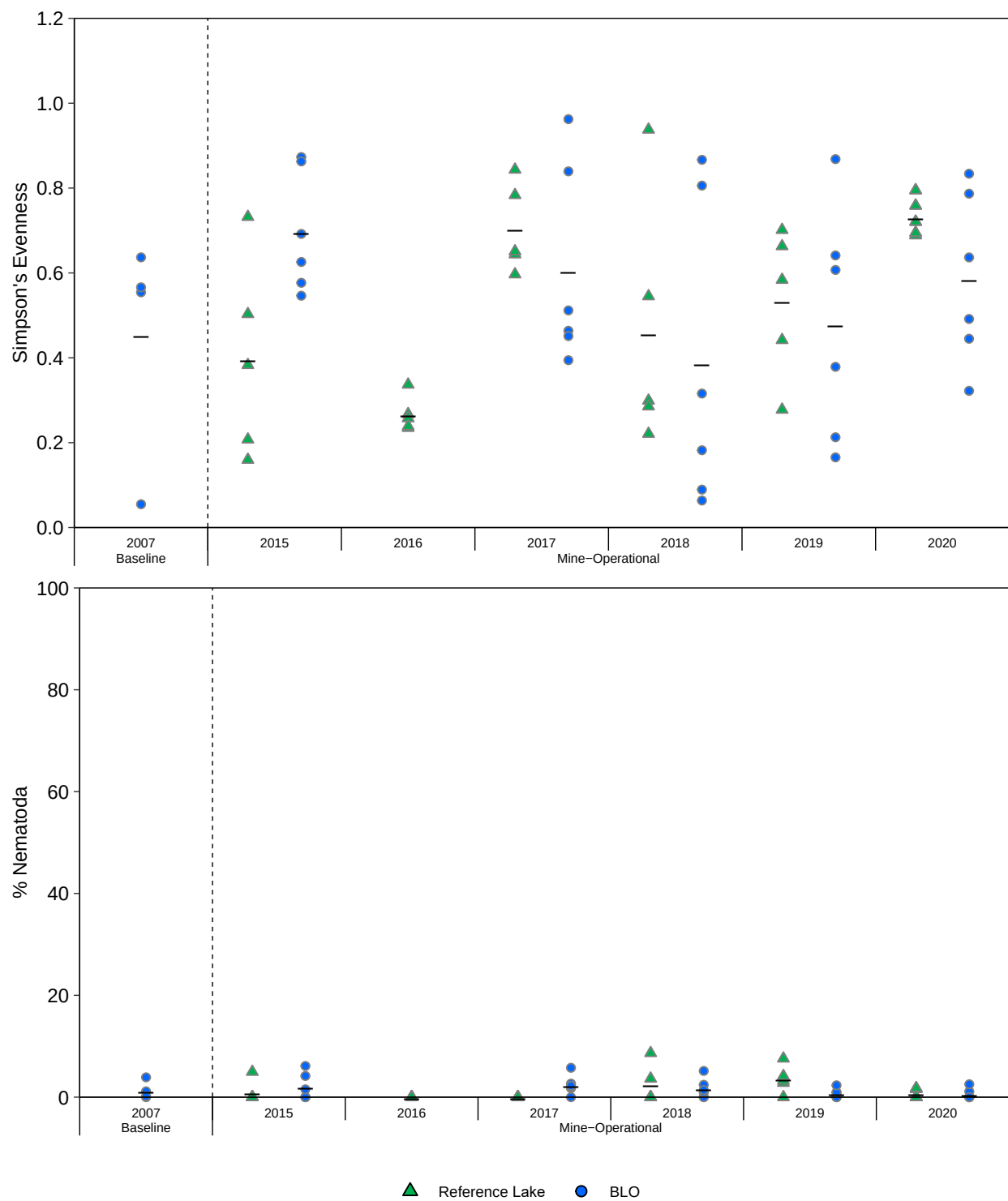


**Figure F.16: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BL0) Profundal Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.



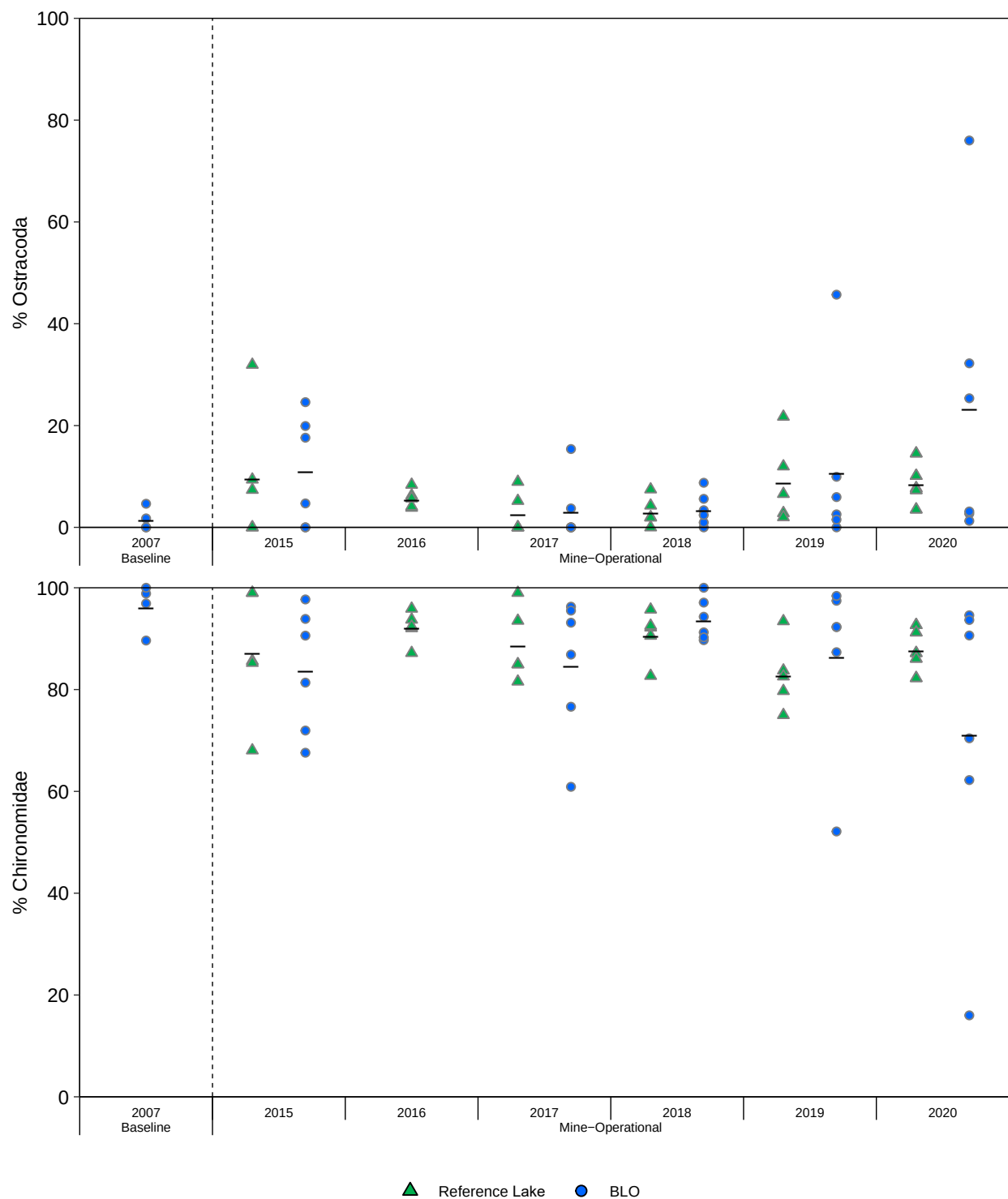


**Figure F.16: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BL0) Profundal Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

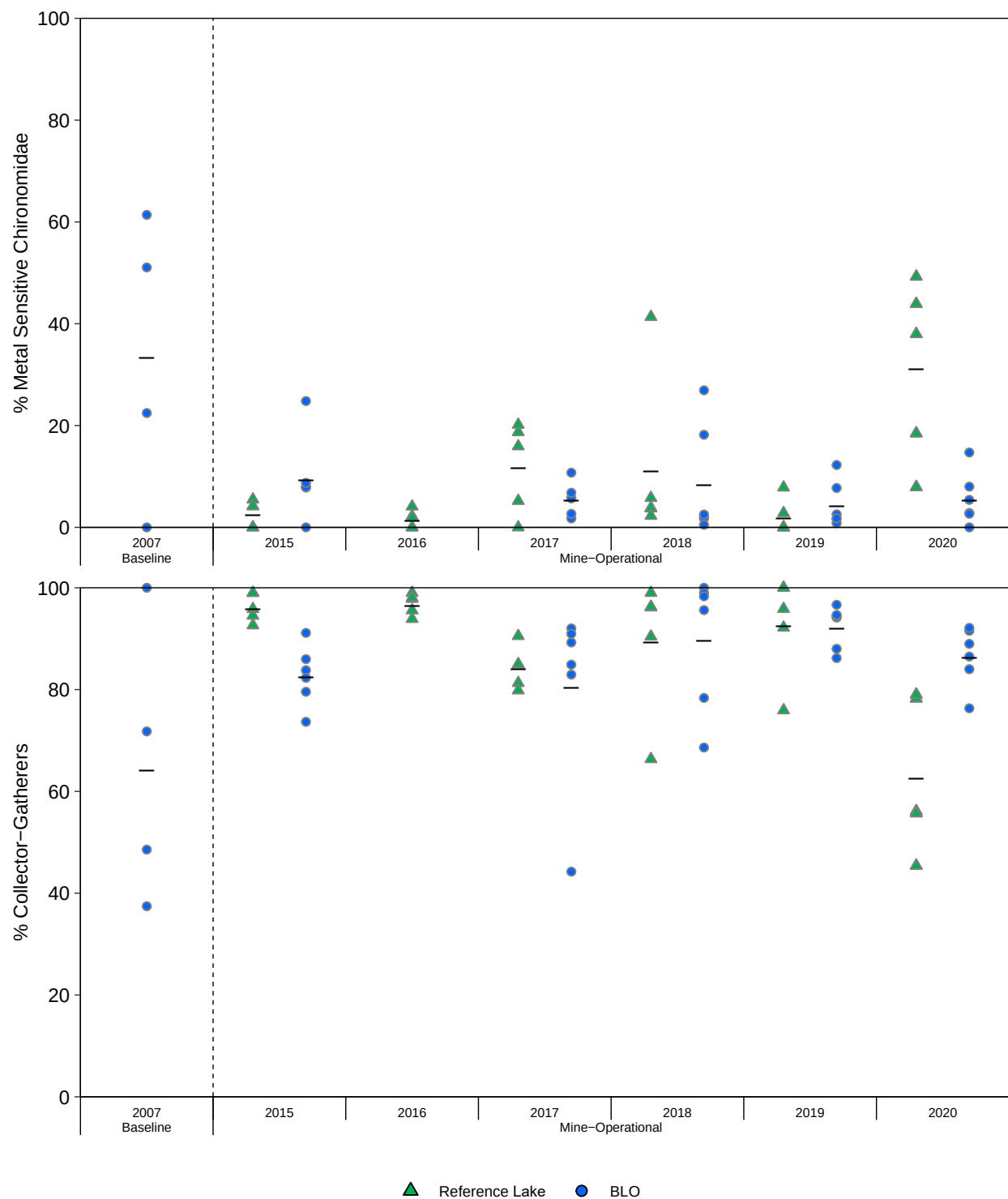


**Figure F.16: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BLO) Profundal Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

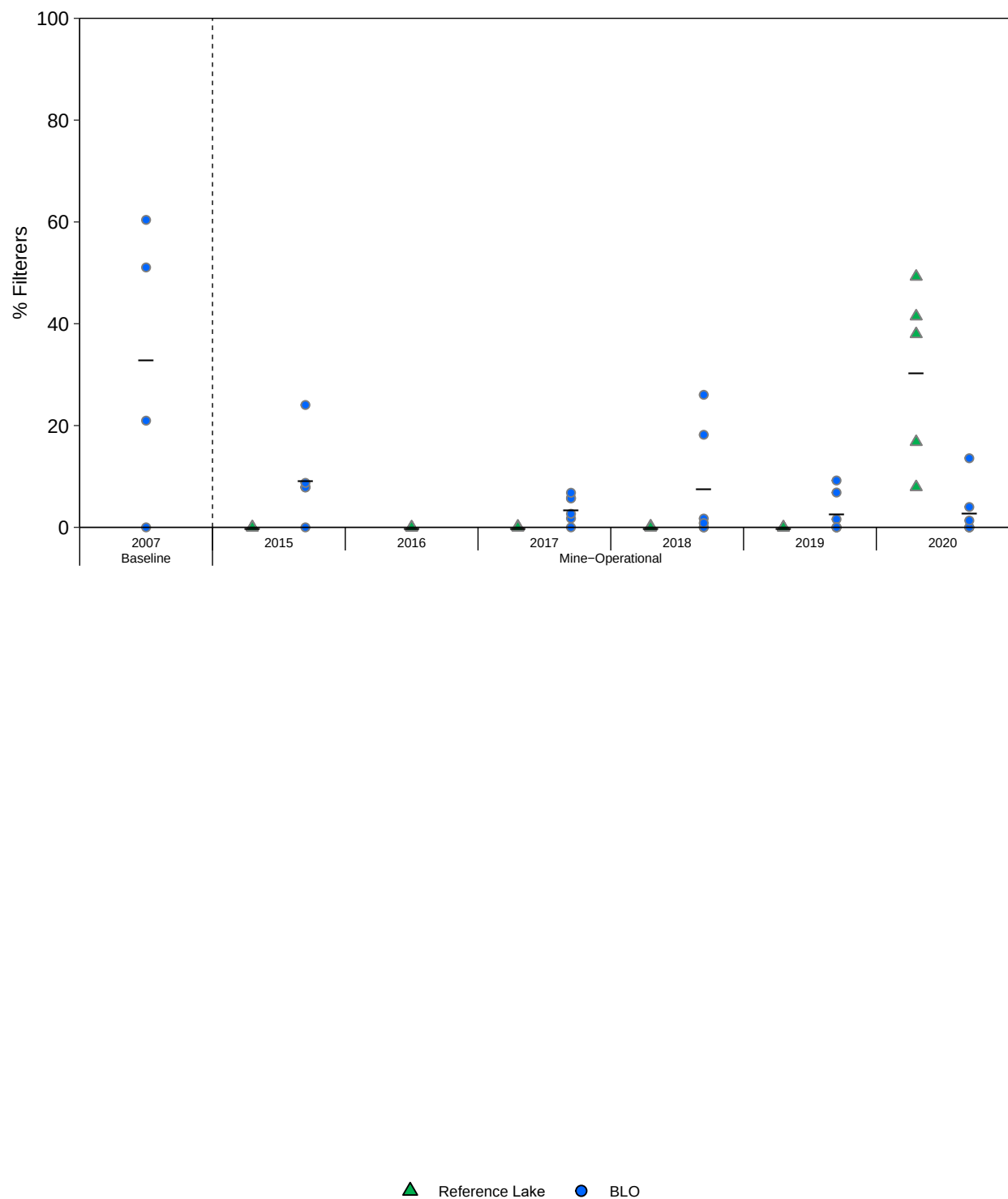


**Figure F.16: Comparison of Key Benthic Invertebrate Community Metrics at Mary Lake (BL0) Profundal Habitat Stations among Mine Baseline (2007) and Operational (2015 to 2020) Periods**

Note: Black bars indicate average of replicates.

**Table F.1:** Replicate Grab Data for Benthic Invertebrate Community Samples Collected at the Unnamed Reference Creek and Camp Lake Tributaries, Mary River Project CREMP, August 2020

| Study Area                          | Station     | Water Depth (cm) |                  |                  | Water Velocity (m/s) |                  |                  | Embeddedness     |                  |                  | In-Stream Vegetation |                  |                  | Algae Presence   |                  |                  |
|-------------------------------------|-------------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|
|                                     |             | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 |
| Unnamed Reference Creek             | REF-CRK-B1  | 6.0              | 10               | 8.0              | 0.35                 | 0.50             | 0.33             | 25%              | 50%              | 25%              | sparse               | none             | none             | sparse           | sparse           | sparse           |
|                                     | REF-CRK-B2  | 6.0              | 8.0              | 10               | 0.31                 | 0.37             | 0.48             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | REF-CRK-B3  | 16               | 8.0              | 7.0              | 0.33                 | 0.37             | 0.31             | 50%              | 50%              | 50%              | none                 | none             | none             | sparse           | sparse           | common           |
|                                     | REF-CRK-B4  | 10               | 12               | 8.0              | 0.50                 | 0.51             | 0.42             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | REF-CRK-B5  | 10               | 8.0              | 9.0              | 0.37                 | 0.35             | 0.38             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
| Camp Lake Tributary 1<br>Upstream   | CLT-1-US-B1 | 12               | 10               | 12               | 0.46                 | 0.34             | 0.45             | 75%              | 50%              | 75%              | none                 | common           | none             | sparse           | sparse           | common           |
|                                     | CLT-1-US-B2 | 9.0              | 15               | 13               | 0.41                 | 0.34             | 0.32             | 50%              | 25%              | 75%              | none                 | none             | none             | common           | common           | common           |
|                                     | CLT-1-US-B3 | 10               | 20               | 8.0              | 0.38                 | 0.45             | 0.31             | 50%              | 50%              | -                | sparse               | sparse           | -                | common           | common           | -                |
|                                     | CLT-1-US-B4 | 9.0              | 18               | 20               | 0.33                 | 0.38             | 0.42             | 25%              | 50%              | 50%              | sparse               | sparse           | sparse           | sparse           | sparse           | common           |
|                                     | CLT-1-US-B5 | 14               | 5.0              | 10               | 0.38                 | 0.35             | 0.31             | 0%               | 25%              | 25%              | sparse               | sparse           | sparse           | sparse           | sparse           | sparse           |
| Camp Lake Tributary 1<br>Downstream | CLT-1-DS-B1 | 6.0              | 6.0              | 12               | 0.38                 | 0.44             | 0.31             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | common           |
|                                     | CLT-1-DS-B2 | 8.0              | 10               | 12               | 0.45                 | 0.31             | 0.36             | 25%              | 50%              | 25%              | none                 | none             | sparse           | sparse           | sparse           | sparse           |
|                                     | CLT-1-DS-B3 | 8.0              | 10               | 12               | 0.36                 | 0.32             | 0.42             | 25%              | 25%              | 25%              | sparse               | common           | sparse           | sparse           | sparse           | sparse           |
|                                     | CLT-1-DS-B4 | 12               | 6.0              | 6.0              | 0.54                 | 0.42             | 0.35             | 25%              | 25%              | 25%              | common               | sparse           | common           | sparse           | common           | sparse           |
|                                     | CLT-1-DS-B5 | 6.0              | 7.0              | 10               | 0.35                 | 0.32             | 0.41             | 25%              | 25%              | 50%              | sparse               | common           | sparse           | sparse           | sparse           | sparse           |
| Camp Lake Tributary 2<br>Upstream   | CLT-2-US-B1 | 12               | 8.0              | 14               | 0.56                 | 0.34             | 0.51             | 50%              | 25%              | 50%              | sparse               | sparse           | sparse           | common           | sparse           | common           |
|                                     | CLT-2-US-B2 | 12               | 10               | 14               | 0.36                 | 0.51             | 0.38             | 25%              | 25%              | 50%              | sparse               | sparse           | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-US-B3 | 11               | 12               | 8.0              | 0.47                 | 0.55             | 0.37             | 25%              | 50%              | 50%              | sparse               | sparse           | sparse           | sparse           | sparse           | sparse           |
|                                     | CLT-2-US-B4 | 12               | 10               | 6.0              | 0.55                 | 0.44             | 0.31             | 50%              | 50%              | 50%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-US-B5 | 6.0              | 10               | 8.0              | 0.46                 | 0.31             | 0.51             | 25%              | 50%              | 50%              | none                 | none             | none             | sparse           | common           | sparse           |
| Camp Lake Tributary 2<br>Downstream | CLT-2-DS-B1 | 6.0              | 10               | 8.0              | 0.49                 | 0.31             | 0.34             | 25%              | 50%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-DS-B2 | 12               | 12               | 6.0              | 0.45                 | 0.35             | 0.31             | 25%              | 25%              | 50%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-DS-B3 | 12               | 10               | 6.0              | 0.42                 | 0.55             | 0.35             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-DS-B4 | 8.0              | 10               | 12               | 0.48                 | 0.36             | 0.31             | 25%              | 25%              | 50%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                     | CLT-2-DS-B5 | 10               | 8.0              | 12               | 0.42                 | 0.51             | 0.33             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |

Note: "-" indicates no data available.

**Table F.2: Replicate Station Habitat Feature Summary Statistics for the Camp Lake Tributary Benthic Stations, Mary River Project CREMP, August 2020**

| Metric                            | Study Area              | Sample Size | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
|-----------------------------------|-------------------------|-------------|------|--------------------|----------------|---------|---------|
| <b>Water Depth (m)</b>            | Unnamed Reference Creek | 5           | 9.1  | 1.09               | 0.49           | 8.00    | 10.3    |
|                                   | CLT1-US North Branch    | 5           | 12.3 | 2.20               | 0.98           | 9.67    | 15.7    |
|                                   | CLT1-DS Lower Main Stem | 5           | 8.7  | 1.16               | 0.52           | 7.67    | 10.0    |
|                                   | CLT2-US Upstream        | 5           | 10.2 | 1.59               | 0.71           | 8.00    | 12.0    |
|                                   | CLT2-DS Downstream      | 5           | 9.5  | 0.869              | 0.39           | 8.00    | 10.0    |
| <b>Water Velocity (m/s)</b>       | Unnamed Reference Creek | 5           | 0.39 | 0.052              | 0.023          | 0.34    | 0.48    |
|                                   | CLT1-US North Branch    | 5           | 0.38 | 0.027              | 0.012          | 0.35    | 0.42    |
|                                   | CLT1-DS Lower Main Stem | 5           | 0.38 | 0.031              | 0.014          | 0.36    | 0.44    |
|                                   | CLT2-US Upstream        | 5           | 0.44 | 0.023              | 0.010          | 0.42    | 0.47    |
|                                   | CLT2-DS Downstream      | 5           | 0.40 | 0.030              | 0.013          | 0.37    | 0.44    |
| <b>Substrate Embeddedness (%)</b> | Unnamed Reference Creek | 5           | 0.38 | 0.095              | 0.042          | 0.25    | 0.50    |
|                                   | CLT1-US North Branch    | 5           | 0.45 | 0.183              | 0.082          | 0.17    | 0.67    |
|                                   | CLT1-DS Lower Main Stem | 5           | 0.28 | 0.046              | 0.020          | 0.25    | 0.33    |
|                                   | CLT2-US Upstream        | 5           | 0.42 | 0.059              | 0.026          | 0.33    | 0.50    |
|                                   | CLT2-DS Downstream      | 5           | 0.30 | 0.046              | 0.020          | 0.25    | 0.33    |

Note: Five stations were sampled at each study area.

**Table F.3: Benthic Station Habitat Feature Statistical Comparisons among Camp Lake Tributary 1 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                     | Overall 3-group Comparison    |                |                                       |         | Pair-wise, post-hoc comparisons |                 |                                       |         |
|----------------------------|-------------------------------|----------------|---------------------------------------|---------|---------------------------------|-----------------|---------------------------------------|---------|
|                            | Statistical Test <sup>a</sup> | Transformation | Significant Difference between Areas? | p-value | (I) Area                        | (J) Area        | Significant Difference Between Areas? | P-value |
| Water Depth (cm)           | ANOVA                         | none           | YES                                   | 0.006   | Unnamed Reference Creek         | CLT1 Upstream   | YES                                   | 0.019   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT1 Downstream | NO                                    | 0.651   |
|                            |                               |                |                                       |         | CLT1 Upstream                   | CLT1 Downstream | YES                                   | 0.026   |
| Water Velocity (cm/s)      | ANOVA                         | none           | NO                                    | 0.792   | Unnamed Reference Creek         | CLT1 Upstream   | NO                                    | 0.539   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT1 Downstream | NO                                    | 0.456   |
|                            |                               |                |                                       |         | CLT1 Upstream                   | CLT1 Downstream | NO                                    | 0.683   |
| Substrate Embeddedness (%) | ANOVA                         | none           | NO                                    | 0.135   | Unnamed Reference Creek         | CLT1 Upstream   | NO                                    | 0.554   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT1 Downstream | NO                                    | 0.145   |
|                            |                               |                |                                       |         | CLT1 Upstream                   | CLT1 Downstream | NO                                    | 0.154   |

 Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.4: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Unnamed Reference Creek Study Area, August 2020**

| Taxa                    | Study Area        | Unnamed Reference Creek |     |     |     |     |
|-------------------------|-------------------|-------------------------|-----|-----|-----|-----|
|                         | Replicate Station | B1                      | B2  | B3  | B4  | B5  |
| <hr/>                   |                   |                         |     |     |     |     |
| <hr/>                   |                   |                         |     |     |     |     |
| <b>ROUNDWORMS</b>       |                   |                         |     |     |     |     |
| P. Nemata               |                   | 4                       | -   | -   | 4   | 18  |
| <b>ANNELIDS</b>         |                   |                         |     |     |     |     |
| <b>P. Annelida</b>      |                   |                         |     |     |     |     |
| <b>WORMS</b>            |                   |                         |     |     |     |     |
| Cl. Oligochaeta         |                   |                         |     |     |     |     |
| F. Enchytraeidae        |                   | 7                       | 7   | 7   | 11  | 25  |
| <b>ARTHROPODS</b>       |                   |                         |     |     |     |     |
| <b>P. Arthropoda</b>    |                   |                         |     |     |     |     |
| <b>MITES</b>            |                   |                         |     |     |     |     |
| Cl. Arachnida           |                   |                         |     |     |     |     |
| O. Acarina              |                   |                         |     |     |     |     |
| F. Lebertiidae          |                   |                         |     |     |     |     |
| Lebertia                |                   | -                       | 4   | -   | -   | -   |
| F. Sperchonidae         |                   |                         |     |     |     |     |
| Sperchon                |                   | 18                      | 25  | 29  | 29  | 18  |
| <b>SEED SHRIMPS</b>     |                   |                         |     |     |     |     |
| Cl. Ostracoda           |                   | 290                     | 161 | 104 | 434 | 100 |
| <b>SPRINGTAILS</b>      |                   |                         |     |     |     |     |
| Cl. Entognatha          |                   |                         |     |     |     |     |
| O. Collembola           |                   | -                       | -   | -   | -   | -   |
| <b>INSECTS</b>          |                   |                         |     |     |     |     |
| Cl. Insecta             |                   |                         |     |     |     |     |
| <b>MAYFLIES</b>         |                   |                         |     |     |     |     |
| O. Ephemeroptera        |                   |                         |     |     |     |     |
| F. Baetidae             |                   |                         |     |     |     |     |
| Acentrella feropagus    |                   | 29                      | 18  | 4   | 22  | 7   |
| <b>STONEFLIES</b>       |                   |                         |     |     |     |     |
| O. Plecoptera           |                   |                         |     |     |     |     |
| F. Capniidae            |                   |                         |     |     |     |     |
| immature                |                   | -                       | -   | -   | -   | -   |
| <b>TRUE FLIES</b>       |                   |                         |     |     |     |     |
| O. Diptera              |                   |                         |     |     |     |     |
| <b>BITING-MIDGE</b>     |                   |                         |     |     |     |     |
| F. Ceratopogonidae      |                   |                         |     |     |     |     |
| Culicoides              |                   | 14                      | 11  | -   | -   | -   |
| <b>MIDGES</b>           |                   |                         |     |     |     |     |
| F. Chironomidae         |                   |                         |     |     |     |     |
| chironomid pupae        |                   | -                       | 14  | 4   | 14  | 4   |
| S.F. Chironominae       |                   |                         |     |     |     |     |
| Micropsectra            |                   | -                       | -   | -   | -   | -   |
| Paratanytarsus          |                   | -                       | -   | -   | -   | -   |
| Rheotanytarsus          |                   | 7                       | -   | -   | -   | -   |
| S.F. Diamesinae         |                   |                         |     |     |     |     |
| Diamesa                 |                   | 7                       | -   | -   | 4   | -   |
| Pseudokiefferiella      |                   | 11                      | 4   | -   | 4   | -   |
| S.F. Orthocladiinae     |                   |                         |     |     |     |     |
| Cardiocladius           |                   | -                       | -   | -   | -   | -   |
| Chaetocladius           |                   | -                       | 4   | -   | -   | -   |
| Corynoneura             |                   | 11                      | -   | -   | 4   | -   |
| Cricotopus              |                   | 29                      | 4   | 4   | -   | 7   |
| Cricotopus/Orthocladius |                   | -                       | -   | -   | -   | -   |
| Eukiefferiella          |                   | 25                      | 36  | -   | 29  | 57  |

**Table F.4: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Unnamed Reference Creek Study Area, August 2020**

| Taxa                                                         | Study Area<br>Replicate Station | Unnamed Reference Creek |       |       |          |       |
|--------------------------------------------------------------|---------------------------------|-------------------------|-------|-------|----------|-------|
|                                                              |                                 | B1                      | B2    | B3    | B4       | B5    |
| <i>Hydrobaenus</i>                                           |                                 | -                       | -     | -     | -        | -     |
| <i>Hydrosmitia</i>                                           |                                 | 14                      | -     | -     | -        | -     |
| <i>Krenosmitia</i>                                           |                                 | 4                       | 4     | -     | -        | -     |
| <i>Limnophyes</i>                                            |                                 | 7                       | 7     | -     | 4        | 4     |
| <i>Metriocnemus</i>                                          |                                 | -                       | -     | -     | -        | -     |
| <i>Orthocladius (Euorthocladius)</i>                         |                                 | -                       | 18    | -     | 47       | 29    |
| <i>Parakiefferiella</i>                                      |                                 | -                       | -     | -     | -        | -     |
| <i>Paraphaenocladius</i>                                     |                                 | -                       | -     | -     | 4        | 4     |
| <i>Psectrocladius</i>                                        |                                 | -                       | -     | -     | -        | -     |
| <i>Thienemanniella</i>                                       |                                 | -                       | -     | -     | -        | -     |
| <i>Tokunagaia</i>                                            |                                 | 47                      | 79    | 18    | 32       | 111   |
| <i>Tvetenia</i>                                              |                                 | 140                     | 276   | 65    | 305      | 190   |
| indeterminate                                                |                                 | -                       | -     | -     | -        | -     |
| <b>S.F. Podonominae</b>                                      |                                 |                         |       |       |          |       |
| <i>Trichotanypus</i>                                         |                                 | -                       | -     | -     | -        | -     |
| <b>S.F. Tanypodinae</b>                                      |                                 |                         |       |       |          |       |
| <i>Thienemannimyia</i> complex                               |                                 | 11                      | 11    | 11    | -        | -     |
| <b>F. Empididae</b>                                          |                                 |                         |       |       |          |       |
| <i>Clinocera</i>                                             |                                 | -                       | -     | -     | -        | -     |
| <b>F. Muscidae</b>                                           |                                 | -                       | -     | -     | -        | -     |
| <b>F. Simuliidae</b>                                         |                                 |                         |       |       |          |       |
| <i>Gymnopaia</i>                                             |                                 | -                       | -     | -     | 7        | -     |
| <i>Metacnephia</i>                                           |                                 | 29                      | 36    | -     | 36       | 4     |
| <i>Prosimulium</i>                                           |                                 | 122                     | 97    | -     | 43       | 18    |
| pupae                                                        |                                 | <b>25</b>               | -     | -     | <b>4</b> | -     |
| <b>F. Tipulidae</b>                                          |                                 |                         |       |       |          |       |
| <i>Dicranota</i>                                             |                                 | -                       | -     | -     | -        | -     |
| <i>Tipula</i>                                                |                                 | -                       | 7     | 14    | -        | 7     |
| <b>Number of Organisms (No. organisms per m<sup>2</sup>)</b> |                                 | 849                     | 821   | 258   | 1,032    | 602   |
| <b>Richness (total number of taxa)<sup>a</sup></b>           |                                 | 20                      | 19    | 9     | 17       | 15    |
| <b>Simpson's Evenness (E)</b>                                |                                 | 0.860                   | 0.856 | 0.840 | 0.767    | 0.878 |
| <b>Shannon-Wiener Diversity</b>                              |                                 | 3.13                    | 3.00  | 2.40  | 2.48     | 2.95  |
| <b>Percent Composition</b>                                   |                                 |                         |       |       |          |       |
| % Nemata                                                     |                                 | 0.4                     | 0.0   | 0.0   | 0.3      | 3.0   |
| % Oligochaeta                                                |                                 | 0.8                     | 0.9   | 2.8   | 1.0      | 4.2   |
| % Hydracarina                                                |                                 | 2.1                     | 3.5   | 11.1  | 2.8      | 3.0   |
| % Ostracods                                                  |                                 | 34.2                    | 19.7  | 40.3  | 42.0     | 16.7  |
| % Ephemeroptera                                              |                                 | 3.4                     | 2.2   | 1.4   | 2.1      | 1.2   |
| % Chironomids                                                |                                 | 36.7                    | 55.5  | 38.9  | 43.1     | 67.3  |
| % Metal Sensitive Chironomids                                |                                 | 3.0                     | 0.5   | 0.0   | 0.7      | 0.0   |
| % Simuliidae                                                 |                                 | 20.7                    | 16.2  | 0.0   | 8.7      | 3.6   |
| % Tipulidae                                                  |                                 | 0.0                     | 0.9   | 5.6   | 0.0      | 1.2   |
| <b>Functional Feeding Group Composition</b>                  |                                 |                         |       |       |          |       |
| % Collector - Gatherers                                      |                                 | 70.0                    | 76.4  | 77.6  | 88.5     | 91.1  |
| % Filterers                                                  |                                 | 21.5                    | 16.2  | 0.0   | 8.0      | 3.6   |
| % Shredders                                                  |                                 | 3.4                     | 1.3   | 7.0   | 0.0      | 2.4   |
| <b>Habitat Preference Group Composition</b>                  |                                 |                         |       |       |          |       |
| % Clingers                                                   |                                 | 27.0                    | 20.1  | 12.6  | 11.5     | 7.7   |
| % Sprawlers                                                  |                                 | 70.0                    | 76.8  | 79.1  | 87.2     | 83.9  |
| % Burrowers                                                  |                                 | 3.0                     | 3.1   | 8.3   | 1.4      | 8.3   |

<sup>a</sup> Bold entries excluded from taxa count



**Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2020**

| Taxa                    | Study Area        | North Branch Upstream (CLT1-US) |     |     |     |     |
|-------------------------|-------------------|---------------------------------|-----|-----|-----|-----|
|                         | Replicate Station | B1                              | B2  | B3  | B4  | B5  |
| <hr/>                   |                   |                                 |     |     |     |     |
| <hr/>                   |                   |                                 |     |     |     |     |
| <b>ROUNDWORMS</b>       |                   |                                 |     |     |     |     |
| P. Nemata               |                   | 29                              | 65  | 22  | -   | 11  |
| <b>ANNELIDS</b>         |                   |                                 |     |     |     |     |
| P. Annelida             |                   |                                 |     |     |     |     |
| <b>WORMS</b>            |                   |                                 |     |     |     |     |
| Cl. Oligochaeta         |                   |                                 |     |     |     |     |
| F. Enchytraeidae        |                   | 104                             | 118 | 93  | 32  | 25  |
| <b>ARTHROPODS</b>       |                   |                                 |     |     |     |     |
| P. Arthropoda           |                   |                                 |     |     |     |     |
| <b>MITES</b>            |                   |                                 |     |     |     |     |
| Cl. Arachnida           |                   |                                 |     |     |     |     |
| O. Acarina              |                   |                                 |     |     |     |     |
| F. Lebertiidae          |                   |                                 |     |     |     |     |
| Lebertia                |                   | -                               | -   | -   | -   | -   |
| F. Sperchonidae         |                   |                                 |     |     |     |     |
| Sperchon                |                   | 93                              | 14  | -   | 25  | 61  |
| <b>SEED SHRIMPS</b>     |                   |                                 |     |     |     |     |
| Cl. Ostracoda           |                   | 7                               | 22  | -   | -   | 14  |
| <b>SPRINGTAILS</b>      |                   |                                 |     |     |     |     |
| Cl. Entognatha          |                   |                                 |     |     |     |     |
| O. Collembola           |                   | -                               | 4   | -   | 14  | 7   |
| <b>INSECTS</b>          |                   |                                 |     |     |     |     |
| Cl. Insecta             |                   |                                 |     |     |     |     |
| <b>MAYFLIES</b>         |                   |                                 |     |     |     |     |
| O. Ephemeroptera        |                   |                                 |     |     |     |     |
| F. Baetidae             |                   |                                 |     |     |     |     |
| Acentrella feropagus    |                   | -                               | -   | -   | -   | 4   |
| <b>STONEFLIES</b>       |                   |                                 |     |     |     |     |
| O. Plecoptera           |                   |                                 |     |     |     |     |
| F. Capniidae            |                   |                                 |     |     |     |     |
| immature                |                   | -                               | 4   | -   | -   | -   |
| <b>TRUE FLIES</b>       |                   |                                 |     |     |     |     |
| O. Diptera              |                   |                                 |     |     |     |     |
| <b>BITING-MIDGE</b>     |                   |                                 |     |     |     |     |
| F. Ceratopogonidae      |                   |                                 |     |     |     |     |
| Culicoides              |                   | -                               | -   | -   | -   | -   |
| <b>MIDGES</b>           |                   |                                 |     |     |     |     |
| F. Chironomidae         |                   |                                 |     |     |     |     |
| chironomid pupae        |                   | 115                             | 93  | 79  | 50  | 108 |
| S.F. Chironominae       |                   |                                 |     |     |     |     |
| Micropsectra            |                   | 25                              | 272 | 93  | -   | -   |
| Paratanytarsus          |                   | -                               | -   | -   | -   | 22  |
| Rheotanytarsus          |                   | -                               | -   | -   | -   | -   |
| S.F. Diamesinae         |                   |                                 |     |     |     |     |
| Diamesa                 |                   | 7                               | 7   | -   | -   | -   |
| Pseudokiefferiella      |                   | 244                             | 72  | 323 | 57  | 57  |
| S.F. Orthocladiinae     |                   |                                 |     |     |     |     |
| Cardiocladius           |                   | -                               | -   | -   | -   | -   |
| Chaetocladius           |                   | 14                              | -   | -   | -   | -   |
| Corynoneura             |                   | 7                               | 29  | 22  | 7   | 11  |
| Cricotopus              |                   | 179                             | 495 | 523 | 151 | 82  |
| Cricotopus/Orthocladius |                   | 362                             | 244 | 330 | 39  | 125 |
| Eukiefferiella          |                   | -                               | -   | -   | 29  | -   |

**Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2020**

| Taxa                                                         | Study Area<br>Replicate Station | North Branch Upstream (CLT1-US) |       |       |       |       |
|--------------------------------------------------------------|---------------------------------|---------------------------------|-------|-------|-------|-------|
|                                                              |                                 | B1                              | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                           |                                 | -                               | 29    | 7     | 7     | -     |
| <i>Hydrosmitia</i>                                           |                                 | 61                              | 409   | 330   | 25    | 32    |
| <i>Krenosmitia</i>                                           |                                 | 14                              | 36    | 7     | 11    | 14    |
| <i>Limnophyes</i>                                            |                                 | 47                              | 29    | 14    | 4     | 11    |
| <i>Metriocnemus</i>                                          |                                 | 39                              | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>                         |                                 | 265                             | 14    | 366   | 118   | 147   |
| <i>Parakiefferiella</i>                                      |                                 | -                               | -     | 36    | -     | -     |
| <i>Paraphaenocladius</i>                                     |                                 | -                               | -     | -     | -     | -     |
| <i>Psectrocladius</i>                                        |                                 | -                               | -     | -     | 4     | -     |
| <i>Thienemanniella</i>                                       |                                 | -                               | -     | -     | -     | 11    |
| <i>Tokunagaia</i>                                            |                                 | 115                             | 29    | -     | 57    | 43    |
| <i>Tvetenia</i>                                              |                                 | 61                              | 22    | 22    | 14    | 79    |
| indeterminate                                                |                                 | -                               | -     | 7     | -     | -     |
| <b>S.F. Podonominae</b>                                      |                                 |                                 |       |       |       |       |
| <i>Trichotanytus</i>                                         |                                 | -                               | 7     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                                      |                                 |                                 |       |       |       |       |
| <i>Thienemanniella</i> complex                               |                                 | 7                               | -     | -     | 7     | -     |
| <b>F. Empididae</b>                                          |                                 |                                 |       |       |       |       |
| <i>Clinocera</i>                                             |                                 | 32                              | 7     | 7     | 7     | 7     |
| <b>F. Muscidae</b>                                           |                                 | -                               | -     | -     | -     | -     |
| <b>F. Simuliidae</b>                                         |                                 |                                 |       |       |       |       |
| <i>Gymnopais</i>                                             |                                 | -                               | -     | -     | -     | 7     |
| <i>Metacnephia</i>                                           |                                 | -                               | -     | -     | -     | -     |
| <i>Prosimulium</i>                                           |                                 | 4                               | -     | -     | 4     | -     |
| pupae                                                        |                                 | -                               | -     | -     | -     | -     |
| <b>F. Tipulidae</b>                                          |                                 |                                 |       |       |       |       |
| <i>Dicranota</i>                                             |                                 | -                               | -     | -     | -     | -     |
| <i>Tipula</i>                                                |                                 | 72                              | 82    | 108   | 47    | 197   |
| <b>Number of Organisms (No. organisms per m<sup>2</sup>)</b> |                                 | 1,903                           | 2,100 | 2,387 | 710   | 1,075 |
| <b>Richness (total number of taxa)<sup>a</sup></b>           |                                 | 21                              | 21    | 15    | 19    | 20    |
| <b>Simpson's Evenness (E)</b>                                |                                 | 0.900                           | 0.835 | 0.867 | 0.905 | 0.912 |
| <b>Shannon-Wiener Diversity</b>                              |                                 | 3.364                           | 2.968 | 2.793 | 3.348 | 3.400 |
| <b>Percent Composition</b>                                   |                                 |                                 |       |       |       |       |
| % Nemata                                                     |                                 | 1.5                             | 3.1   | 0.9   | 0.0   | 1.0   |
| % Oligochaeta                                                |                                 | 5.5                             | 5.6   | 3.9   | 4.5   | 2.3   |
| % Hydracarina                                                |                                 | 4.9                             | 0.7   | 0.0   | 3.5   | 5.7   |
| % Ostracods                                                  |                                 | 0.4                             | 1.0   | 0.0   | 0.0   | 1.3   |
| % Ephemeroptera                                              |                                 | 0.0                             | 0.0   | 0.0   | 0.0   | 0.3   |
| % Chironomids                                                |                                 | 82.1                            | 85.0  | 90.4  | 81.8  | 69.0  |
| % Metal Sensitive Chironomids                                |                                 | 15.6                            | 17.6  | 18.1  | 8.8   | 8.6   |
| % Simuliidae                                                 |                                 | 0.2                             | 0.0   | 0.0   | 0.5   | 0.7   |
| % Tipulidae                                                  |                                 | 3.8                             | 3.9   | 4.5   | 6.6   | 18.3  |
| <b>Functional Feeding Group Composition</b>                  |                                 |                                 |       |       |       |       |
| % Collector - Gatherers                                      |                                 | 69.2                            | 44.5  | 59.9  | 60.7  | 58.5  |
| % Filterers                                                  |                                 | 1.6                             | 13.7  | 4.1   | 0.5   | 2.3   |
| % Shredders                                                  |                                 | 22.2                            | 40.8  | 35.7  | 33.2  | 32.2  |
| <b>Habitat Preference Group Composition</b>                  |                                 |                                 |       |       |       |       |
| % Clingers                                                   |                                 | 26.6                            | 51.5  | 35.5  | 31.7  | 20.9  |
| % Sprawlers                                                  |                                 | 60.4                            | 35.7  | 55.1  | 55.2  | 56.8  |
| % Burrowers                                                  |                                 | 13.0                            | 12.6  | 9.3   | 11.1  | 21.7  |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2020**

| Taxa                    | Study Area        | Lower Main Stem (CLT1-DS) |    |    |     |    |
|-------------------------|-------------------|---------------------------|----|----|-----|----|
|                         | Replicate Station | B1                        | B2 | B3 | B4  | B5 |
| <hr/>                   |                   |                           |    |    |     |    |
| <hr/>                   |                   |                           |    |    |     |    |
| <b>ROUNDWORMS</b>       |                   |                           |    |    |     |    |
| P. Nemata               |                   | 32                        | 7  | 7  | 7   | 11 |
| <b>ANNELIDS</b>         |                   |                           |    |    |     |    |
| P. Annelida             |                   |                           |    |    |     |    |
| <b>WORMS</b>            |                   |                           |    |    |     |    |
| Cl. Oligochaeta         |                   |                           |    |    |     |    |
| F. Enchytraeidae        |                   | 197                       | 18 | 18 | 161 | 36 |
| <b>ARTHROPODS</b>       |                   |                           |    |    |     |    |
| P. Arthropoda           |                   |                           |    |    |     |    |
| <b>MITES</b>            |                   |                           |    |    |     |    |
| Cl. Arachnida           |                   |                           |    |    |     |    |
| O. Acarina              |                   |                           |    |    |     |    |
| F. Lebertiidae          |                   |                           |    |    |     |    |
| Lebertia                |                   | -                         | -  | -  | -   | -  |
| F. Sperchonidae         |                   |                           |    |    |     |    |
| Sperchon                |                   | 11                        | -  | 11 | 7   | 11 |
| <b>SEED SHRIMPS</b>     |                   |                           |    |    |     |    |
| Cl. Ostracoda           |                   | 4                         | -  | -  | -   | -  |
| <b>SPRINGTAILS</b>      |                   |                           |    |    |     |    |
| Cl. Entognatha          |                   |                           |    |    |     |    |
| O. Collembola           |                   | -                         | -  | -  | -   | -  |
| <b>INSECTS</b>          |                   |                           |    |    |     |    |
| Cl. Insecta             |                   |                           |    |    |     |    |
| <b>MAYFLIES</b>         |                   |                           |    |    |     |    |
| O. Ephemeroptera        |                   |                           |    |    |     |    |
| F. Baetidae             |                   |                           |    |    |     |    |
| Acentrella feropagus    |                   | -                         | -  | 11 | -   | 7  |
| <b>STONEFLIES</b>       |                   |                           |    |    |     |    |
| O. Plecoptera           |                   |                           |    |    |     |    |
| F. Capniidae            |                   |                           |    |    |     |    |
| immature                |                   | -                         | -  | -  | -   | -  |
| <b>TRUE FLIES</b>       |                   |                           |    |    |     |    |
| O. Diptera              |                   |                           |    |    |     |    |
| <b>BITING-MIDGE</b>     |                   |                           |    |    |     |    |
| F. Ceratopogonidae      |                   |                           |    |    |     |    |
| Culicoides              |                   | -                         | -  | -  | 4   | 25 |
| <b>MIDGES</b>           |                   |                           |    |    |     |    |
| F. Chironomidae         |                   |                           |    |    |     |    |
| chironomid pupae        |                   | 39                        | 18 | 14 | 29  | 22 |
| S.F. Chironominae       |                   |                           |    |    |     |    |
| Micropsectra            |                   | -                         | -  | -  | -   | -  |
| Paratanytarsus          |                   | 7                         | -  | 7  | 4   | -  |
| Rheotanytarsus          |                   | -                         | -  | -  | -   | -  |
| S.F. Diamesinae         |                   |                           |    |    |     |    |
| Diamesa                 |                   | -                         | 4  | 7  | 11  | -  |
| Pseudokiefferiella      |                   | 11                        | 11 | -  | 22  | 14 |
| S.F. Orthocladiinae     |                   |                           |    |    |     |    |
| Cardiocladius           |                   | -                         | -  | -  | -   | -  |
| Chaetocladius           |                   | -                         | -  | -  | -   | -  |
| Corynoneura             |                   | 4                         | 4  | -  | -   | -  |
| Cricotopus              |                   | 36                        | 47 | 14 | 32  | 22 |
| Cricotopus/Orthocladius |                   | 11                        | 22 | 11 | 18  | 39 |
| Eukiefferiella          |                   | -                         | -  | -  | 7   | -  |

**Table F.5: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 1 Study Areas, August 2020**

| Taxa                                                         | Study Area<br>Replicate Station | Lower Main Stem (CLT1-DS) |       |       |       |       |
|--------------------------------------------------------------|---------------------------------|---------------------------|-------|-------|-------|-------|
|                                                              |                                 | B1                        | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                           |                                 | 11                        | 7     | 4     | 14    | 4     |
| <i>Hydrosmitia</i>                                           |                                 | 380                       | 276   | 57    | 283   | 237   |
| <i>Krenosmitia</i>                                           |                                 | 25                        | 4     | 14    | 11    | 4     |
| <i>Limnophyes</i>                                            |                                 | 7                         | 7     | 4     | -     | 11    |
| <i>Metriocnemus</i>                                          |                                 | -                         | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>                         |                                 | 11                        | 11    | 7     | 14    | 14    |
| <i>Parakiefferiella</i>                                      |                                 | 29                        | 4     | -     | 4     | -     |
| <i>Paraphaenocladius</i>                                     |                                 | 7                         | -     | -     | 4     | -     |
| <i>Psectrocladius</i>                                        |                                 | -                         | -     | -     | -     | -     |
| <i>Thienemanniella</i>                                       |                                 | -                         | 4     | -     | -     | -     |
| <i>Tokunagaia</i>                                            |                                 | 25                        | -     | 7     | 18    | 18    |
| <i>Tvetenia</i>                                              |                                 | 32                        | 65    | 54    | 75    | 57    |
| indeterminate                                                |                                 | <b>25</b>                 | -     | -     | -     | -     |
| <b>S.F. Podonominae</b>                                      |                                 |                           |       |       |       |       |
| <i>Trichotanytus</i>                                         |                                 | -                         | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                                      |                                 |                           |       |       |       |       |
| <i>Thienemannimyia</i> complex                               |                                 | -                         | -     | -     | 4     | -     |
| <b>F. Empididae</b>                                          |                                 |                           |       |       |       |       |
| <i>Clinocera</i>                                             |                                 | -                         | 7     | -     | 11    | -     |
| <b>F. Muscidae</b>                                           |                                 | -                         | -     | -     | -     | -     |
| <b>F. Simuliidae</b>                                         |                                 |                           |       |       |       |       |
| <i>Gymnopais</i>                                             |                                 | 4                         | -     | -     | -     | -     |
| <i>Metacnephia</i>                                           |                                 | -                         | -     | -     | 4     | -     |
| <i>Prosimulium</i>                                           |                                 | -                         | -     | -     | -     | -     |
| pupae                                                        |                                 | -                         | -     | -     | -     | -     |
| <b>F. Tipulidae</b>                                          |                                 |                           |       |       |       |       |
| <i>Dicranota</i>                                             |                                 | -                         | -     | -     | 4     | -     |
| <i>Tipula</i>                                                |                                 | 32                        | 47    | 14    | 61    | 32    |
| <b>Number of Organisms (No. organisms per m<sup>2</sup>)</b> |                                 | 939                       | 559   | 262   | 806   | 563   |
| <b>Richness (total number of taxa)<sup>a</sup></b>           |                                 | 19                        | 16    | 15    | 22    | 15    |
| <b>Simpson's Evenness (E)</b>                                |                                 | 0.800                     | 0.745 | 0.929 | 0.839 | 0.825 |
| <b>Shannon-Wiener Diversity</b>                              |                                 | 2.837                     | 2.507 | 3.367 | 3.051 | 2.902 |
| <b>Percent Composition</b>                                   |                                 |                           |       |       |       |       |
| % Nemata                                                     |                                 | 3.4                       | 1.3   | 2.7   | 0.9   | 1.9   |
| % Oligochaeta                                                |                                 | 21.0                      | 3.2   | 6.8   | 20.0  | 6.4   |
| % Hydracarina                                                |                                 | 1.1                       | 0.0   | 4.1   | 0.9   | 1.9   |
| % Ostracods                                                  |                                 | 0.4                       | 0.0   | 0.0   | 0.0   | 0.0   |
| % Ephemeroptera                                              |                                 | 0.0                       | 0.0   | 4.1   | 0.0   | 1.3   |
| % Chironomids                                                |                                 | 70.2                      | 85.9  | 76.7  | 68.0  | 78.3  |
| % Metal Sensitive Chironomids                                |                                 | 2.0                       | 2.7   | 5.9   | 4.7   | 2.7   |
| % Simuliidae                                                 |                                 | 0.4                       | 0.0   | 0.0   | 0.4   | 0.0   |
| % Tipulidae                                                  |                                 | 3.4                       | 8.3   | 5.5   | 8.0   | 5.7   |
| <b>Functional Feeding Group Composition</b>                  |                                 |                           |       |       |       |       |
| % Collector - Gatherers                                      |                                 | 89.2                      | 78.5  | 78.6  | 82.1  | 79.5  |
| % Filterers                                                  |                                 | 0.8                       | 0.0   | 3.0   | 0.9   | 0.0   |
| % Shredders                                                  |                                 | 8.4                       | 20.2  | 14.3  | 13.4  | 14.2  |
| <b>Habitat Preference Group Composition</b>                  |                                 |                           |       |       |       |       |
| % Clingers                                                   |                                 | 6.5                       | 13.2  | 13.0  | 8.5   | 10.3  |
| % Sprawlers                                                  |                                 | 65.6                      | 74.0  | 72.0  | 62.6  | 71.2  |
| % Burrowers                                                  |                                 | 27.9                      | 12.8  | 15.1  | 28.9  | 18.5  |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.6: Benthic Invertebrate Community Summary Statistics for Camp Lake Tributary 1 Study Areas, Mary River Project CREMP, August 2020**

| Metric                                              | Area                    | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|-----------------------------------------------------|-------------------------|-------|--------------------|----------------|---------|--------|---------|
| Density<br>(no. organisms / m <sup>2</sup> )        | Unnamed Reference Creek | 713   | 296                | 133            | 258     | 821    | 1,032   |
|                                                     | CLT1 Upstream           | 1,635 | 711                | 318            | 710     | 1,903  | 2,387   |
|                                                     | CLT1 Downstream         | 626   | 261                | 117            | 262     | 563    | 939     |
| Richness<br>(Number of Taxa)                        | Unnamed Reference Creek | 16.0  | 4.36               | 1.95           | 9       | 17     | 20      |
|                                                     | CLT1 Upstream           | 19.2  | 2.49               | 1.11           | 15      | 20     | 21      |
|                                                     | CLT1 Downstream         | 17.4  | 3.05               | 1.36           | 15      | 16     | 22      |
| Simpson's Evenness                                  | Unnamed Reference Creek | 0.840 | 0.0432             | 0.0193         | 0.767   | 0.856  | 0.878   |
|                                                     | CLT1 Upstream           | 0.884 | 0.0319             | 0.0143         | 0.835   | 0.9    | 0.912   |
|                                                     | CLT1 Downstream         | 0.828 | 0.0671             | 0.03           | 0.745   | 0.825  | 0.929   |
| Nemata<br>(% of community)                          | Unnamed Reference Creek | 0.7%  | 1.3%               | 0.6%           | 0.0%    | 0.3%   | 3.0%    |
|                                                     | CLT1 Upstream           | 1.3%  | 1.1%               | 0.5%           | 0.0%    | 1.0%   | 3.1%    |
|                                                     | CLT1 Downstream         | 2.1%  | 1.0%               | 0.5%           | 0.9%    | 1.9%   | 3.4%    |
| Oligochaeta<br>(% of community)                     | Unnamed Reference Creek | 1.9%  | 1.5%               | 0.7%           | 0.8%    | 1.0%   | 4.2%    |
|                                                     | CLT1 Upstream           | 4.4%  | 1.3%               | 0.6%           | 2.3%    | 4.6%   | 5.6%    |
|                                                     | CLT1 Downstream         | 11.5% | 8.4%               | 3.7%           | 3.2%    | 6.9%   | 21.0%   |
| Hydracarina<br>(% of community)                     | Unnamed Reference Creek | 4.5%  | 3.7%               | 1.7%           | 2.1%    | 3.0%   | 11.1%   |
|                                                     | CLT1 Upstream           | 3.0%  | 2.5%               | 1.1%           | 0.0%    | 3.5%   | 5.7%    |
|                                                     | CLT1 Downstream         | 1.6%  | 1.6%               | 0.7%           | 0.0%    | 1.2%   | 4.1%    |
| Ostracoda<br>(% of community)                       | Unnamed Reference Creek | 30.6% | 11.7%              | 5.3%           | 16.7%   | 34.2%  | 42.0%   |
|                                                     | CLT1 Upstream           | 0.5%  | 0.6%               | 0.3%           | 0.0%    | 0.4%   | 1.3%    |
|                                                     | CLT1 Downstream         | 0.1%  | 0.2%               | 0.1%           | 0.0%    | 0.0%   | 0.4%    |
| Chironomidae<br>(% of community)                    | Unnamed Reference Creek | 48.3% | 12.9%              | 5.8%           | 36.7%   | 43.1%  | 67.3%   |
|                                                     | CLT1 Upstream           | 81.7% | 7.9%               | 3.5%           | 69.0%   | 82.1%  | 90.4%   |
|                                                     | CLT1 Downstream         | 75.8% | 7.1%               | 3.2%           | 68.0%   | 76.7%  | 85.9%   |
| Metal-Sensitive<br>Chironomidae<br>(% of community) | Unnamed Reference Creek | 22.9% | 7.5%               | 3.3%           | 10.6%   | 10.6%  | 30.1%   |
|                                                     | CLT1 Upstream           | 14.4% | 10.4%              | 4.6%           | 1.6%    | 1.6%   | 24.1%   |
|                                                     | CLT1 Downstream         | 7.7%  | 3.4%               | 1.5%           | 3.4%    | 3.4%   | 11.6%   |
| Simuliidae<br>(% of community)                      | Unnamed Reference Creek | 0.3%  | 0.5%               | 0.2%           | 0.0%    | 0.0%   | 1.0%    |
|                                                     | CLT1 Upstream           | 0.0%  | 0.0%               | 0.0%           | 0.0%    | 0.0%   | 0.0%    |
|                                                     | CLT1 Downstream         | 0.0%  | 0.0%               | 0.0%           | 0.0%    | 0.0%   | 0.0%    |
| Tipulidae<br>(% of community)                       | Unnamed Reference Creek | 1.0%  | 1.1%               | 0.5%           | 0.0%    | 0.0%   | 2.9%    |
|                                                     | CLT1 Upstream           | 5.4%  | 1.9%               | 0.9%           | 2.9%    | 2.9%   | 7.4%    |
|                                                     | CLT1 Downstream         | 2.7%  | 2.4%               | 1.1%           | 0.6%    | 0.6%   | 6.9%    |
| Collector-Gatherer<br>FFG<br>(% of community)       | Unnamed Reference Creek | 72.7% | 16.4%              | 7.3%           | 44.3%   | 44.3%  | 83.8%   |
|                                                     | CLT1 Upstream           | 58.8% | 8.6%               | 3.8%           | 52.1%   | 52.1%  | 73.8%   |
|                                                     | CLT1 Downstream         | 81.5% | 6.3%               | 2.8%           | 76.0%   | 76.0%  | 89.6%   |
| Filterer FFG<br>(% of community)                    | Unnamed Reference Creek | 6.6%  | 11.0%              | 4.9%           | 0.6%    | 0.6%   | 26.1%   |
|                                                     | CLT1 Upstream           | 2.0%  | 2.4%               | 1.1%           | 0.0%    | 0.0%   | 5.6%    |
|                                                     | CLT1 Downstream         | 0.8%  | 1.9%               | 0.8%           | 0.0%    | 0.0%   | 4.2%    |
| Shredder FFG<br>(% of community)                    | Unnamed Reference Creek | 12.3% | 7.7%               | 3.4%           | 2.5%    | 2.5%   | 21.4%   |
|                                                     | CLT1 Upstream           | 33.8% | 9.1%               | 4.1%           | 21.1%   | 21.1%  | 41.8%   |
|                                                     | CLT1 Downstream         | 13.9% | 6.1%               | 2.7%           | 7.9%    | 7.9%   | 22.4%   |
| Clinger HPG<br>(% of community)                     | Unnamed Reference Creek | 21.8% | 18.3%              | 8.2%           | 7.3%    | 7.3%   | 52.0%   |
|                                                     | CLT1 Upstream           | 34.1% | 7.6%               | 3.4%           | 21.7%   | 21.7%  | 40.2%   |
|                                                     | CLT1 Downstream         | 14.9% | 5.9%               | 2.7%           | 7.8%    | 7.8%   | 21.5%   |
| Sprawler HPG<br>(% of community)                    | Unnamed Reference Creek | 69.4% | 16.1%              | 7.2%           | 42.8%   | 42.8%  | 83.1%   |
|                                                     | CLT1 Upstream           | 55.8% | 11.0%              | 4.9%           | 46.0%   | 46.0%  | 74.3%   |
|                                                     | CLT1 Downstream         | 75.0% | 9.4%               | 4.2%           | 65.2%   | 65.2%  | 86.3%   |
| Burrower HPG<br>(% of community)                    | Unnamed Reference Creek | 5.7%  | 4.6%               | 2.1%           | 2.7%    | 2.7%   | 13.8%   |
|                                                     | CLT1 Upstream           | 9.3%  | 5.1%               | 2.3%           | 3.9%    | 3.9%   | 17.1%   |
|                                                     | CLT1 Downstream         | 9.0%  | 5.5%               | 2.5%           | 4.4%    | 4.4%   | 17.0%   |

Note: Sample size equals five for all study areas.

**Table F.7: Statistical Comparison of Bray-Curtis Index for Camp Lake Tributary 1 and 2 Compared to Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Mine-Exposed Area     | Comparison         | n         |              | Betadisper P-Value | Mantel Test |                |         | dbRDA   |                |                               |         |
|-----------------------|--------------------|-----------|--------------|--------------------|-------------|----------------|---------|---------|----------------|-------------------------------|---------|
|                       |                    | Reference | Mine-Exposed |                    | r           | R <sup>2</sup> | P-Value | F-Value | R <sup>2</sup> | R <sup>2</sup> <sub>adj</sub> | P-Value |
| Camp Lake Tributary 1 | CLT1-US vs REF-CRK | 5         | 5            | 0.661              | 0.822       | 0.676          | 0.008   | 11.17   | 0.583          | 0.530                         | 0.006   |
|                       | CLT1-DS vs REF-CRK | 5         | 5            | 0.435              | 0.835       | 0.697          | 0.008   | 10.34   | 0.564          | 0.509                         | 0.007   |
| Camp Lake Tributary 2 | CLT2-US vs REF-CRK | 5         | 5            | 0.435              | 0.741       | 0.549          | 0.008   | 8.69    | 0.521          | 0.461                         | 0.008   |
|                       | CLT2-DS vs REF-CRK | 5         | 5            | 0.846              | 0.570       | 0.324          | 0.008   | 5.31    | 0.399          | 0.324                         | 0.007   |



Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.

**Table F.8: Statistical Comparison of Primary and Percent Compositional Benthic Metrics at Camp Lake Tributary 1 North Branch (CLT1 US) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP**

| Metric                                | Overall 8-Year Comparison     |                      |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|----------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transform-ation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                      |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10                | YES                                 | 0.023   | 2007                            | 3               | 505   | 330                | -                      | -3.2                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 949   | 139                | 1.3                    | -                      | a,b                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 1,446 | 836                | 2.9                    | 3.6                    | b                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 1,610 | 806                | 3.3                    | 4.8                    | b                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 1,242 | 143                | 2.2                    | 2.1                    | b                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 1,379 | 524                | 2.6                    | 3.1                    | b                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 1,260 | 313                | 2.3                    | 2.2                    | b                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 1,635 | 711                | 3.4                    | 4.9                    | b                   |
| Richness (No. of Taxa)                | ANOVA                         | none                 | YES                                 | 0.002   | 2007                            | 3               | 13.7  | 2.3                | -                      | -0.3                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 14.3  | 2.1                | 0.3                    | -                      | a,b                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 15.0  | 2.7                | 0.6                    | 0.3                    | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 14.0  | 2.7                | 0.1                    | -0.1                   | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 19.2  | 2.6                | 2.4                    | 2.4                    | b                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 17.2  | 1.5                | 1.5                    | 1.4                    | a,b                 |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 18.0  | 2.1                | 1.9                    | 1.8                    | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 19.2  | 2.5                | 2.4                    | 2.4                    | b                   |
| Simpson's Evenness                    | ANOVA                         | none                 | YES                                 | <0.001  | 2007                            | 3               | 0.749 | 0.082              | -                      | -3.0                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 0.874 | 0.042              | 1.5                    | -                      | b                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 0.899 | 0.037              | 1.8                    | 0.6                    | b                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 0.908 | 0.032              | 1.9                    | 0.8                    | b                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 0.925 | 0.019              | 2.1                    | 1.2                    | b                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 0.877 | 0.058              | 1.6                    | 0.1                    | b                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.884 | 0.036              | 1.6                    | 0.2                    | b                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 0.884 | 0.032              | 1.6                    | 0.2                    | b                   |
| Nemata (% of community)               | ANOVA                         | log10(x+1)           | YES                                 | <0.001  | 2007                            | 3               | 0.1   | 0.3                | -                      | -0.7                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 0.7   | 0.8                | 2.1                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 1.7   | 0.7                | 6.0                    | 1.3                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 1.3   | 0.5                | 4.5                    | 0.8                    | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 4.1   | 2.1                | 15.4                   | 4.4                    | b                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 1.6   | 0.7                | 5.5                    | 1.1                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 1.3   | 0.8                | 4.4                    | 0.7                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 1.3   | 1.1                | 4.5                    | 0.8                    | a                   |
| Hydracarina (% of community)          | ANOVA                         | log10(x+1)           | YES                                 | <0.001  | 2007                            | 3               | 0.8   | 1.0                | -                      | -2.0                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 14.4  | 6.7                | 13.3                   | -                      | b                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 2.3   | 1.7                | 1.5                    | -1.8                   | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 9.8   | 3.2                | 8.8                    | -0.7                   | b,c                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 7.7   | 1.1                | 6.7                    | -1.0                   | c,d                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 5.3   | 1.3                | 4.5                    | -1.4                   | a,c,d               |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 2.0   | 1.7                | 1.1                    | -1.9                   | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 3.0   | 2.5                | 2.1                    | -1.7                   | a,d                 |
| Chironomidae (% of community)         | ANOVA                         | none                 | YES                                 | <0.001  | 2007                            | 3               | 88.1  | 7.2                | -                      | 2.3                    | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 76.3  | 5.1                | -1.7                   | -                      | a,b,c               |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 75.6  | 7.5                | -1.7                   | -0.1                   | a,b,c               |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 68.6  | 10.6               | -2.7                   | -1.5                   | c                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 74.0  | 1.7                | -2.0                   | -0.5                   | a,c                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 86.8  | 4.2                | -0.2                   | 2.1                    | c                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 85.0  | 5.1                | -0.4                   | 1.7                    | b,c                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 81.7  | 7.9                | -0.9                   | 1.1                    | a,b                 |
| Metal Sensitive Taxa (% of community) | ANOVA                         | log10                | NO                                  | 0.255   | 2007                            | 3               | 3.7   | 3.6                | -                      | -1.1                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 10.8  | 6.6                | 2.0                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 12.7  | 14.1               | 2.5                    | 0.3                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 9.1   | 9.0                | 1.5                    | -0.3                   | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 7.2   | 5.2                | 1.0                    | -0.5                   | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 17.8  | 4.8                | 3.9                    | 1.1                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 14.4  | 10.4               | 3.0                    | 0.5                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 13.8  | 4.7                | 2.8                    | 0.5                    | a                   |
| Tipulidae (% of community)            | ANOVA                         | log10                | YES                                 | <0.001  | 2007                            | 3               | 8.9   | 4.1                | -                      | 0.9                    | a,b                 |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 6.9   | 2.1                | -0.5                   | -                      | a,b,c               |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 16.8  | 4.7                | 1.9                    | 4.6                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 16.9  | 11.8               | 2.0                    | 4.7                    | a,b                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 8.4   | 1.5                | -0.1                   | 0.7                    | a,b                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 2.9   | 2.3                | -1.5                   | -1.9                   | c                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 5.5   | 1.9                | -0.8                   | -0.7                   | b,c                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 7.4   | 6.2                | -0.4                   | 0.2                    | a,b                 |



Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).



Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.9: Statistical Comparison of Functional Feeding Group (FFG) Benthic Metrics at Camp Lake Tributary 1 North Branch (CLT1 US) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.001   | 2007                            | 3               | 72.6 | 11.0               | -                      | 2.2                    | a                   |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 41.4 | 14.1               | -2.8                   | -                      | b,c                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 50.2 | 7.3                | -2.0                   | 0.6                    | b,c                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 40.8 | 11.3               | -2.9                   | 0.0                    | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 38.8 | 7.1                | -3.1                   | -0.2                   | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 54.6 | 13.5               | -1.6                   | 0.9                    | a,b,c               |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 58.8 | 8.6                | -1.3                   | 1.2                    | a,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 58.5 | 8.9                | -1.3                   | 1.2                    | a,c                 |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.020   | 2007                            | 3               | 0.3  | 0.3                | -                      | not calculable         | a,b                 |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 0.0  | 0.0                | -1.2                   | -                      | b                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.0  | 0.0                | -1.2                   | not calculable         | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 0.5  | 0.6                | 0.9                    | not calculable         | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 1.3  | 1.5                | 3.9                    | not calculable         | a,c                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.5  | 0.5                | 0.8                    | not calculable         | b,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 2.0  | 2.4                | 6.5                    | not calculable         | a,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 4.4  | 5.3                | 15.7                   | not calculable         | c                   |
| Shredder FFG (% of community)           | ANOVA                         | none                | YES                                 | 0.016   | 2007                            | 3               | 23.1 | 8.8                | -                      | -1.2                   | a                   |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 40.0 | 14.2               | 1.9                    | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 46.1 | 7.3                | 2.6                    | 0.4                    | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 47.8 | 14.0               | 2.8                    | 0.5                    | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 49.5 | 6.4                | 3.0                    | 0.7                    | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 39.3 | 13.2               | 1.8                    | 0.0                    | a,b                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 33.8 | 9.1                | 1.2                    | -0.4                   | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 32.8 | 6.8                | 1.1                    | -0.5                   | a,b                 |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint values between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).



**Table F.10: Statistical Comparison of Primary and Percent Compositional Benthic Metrics at Camp Lake Tributary 1 Lower Main Stem (CLT1 DS) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP**

| Metric                                | Overall 8-Year Comparison     |                      |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|----------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transform-ation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                      |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | none                 | YES                                 | 0.077   | 2007                            | 3               | 754   | 573                | -                      | -0.8                   | a,b                 |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 898   | 183                | 0.3                    | -                      | a,b                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 1,301 | 479                | 1.0                    | 2.2                    | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 1,143 | 443                | 0.7                    | 1.3                    | a,b                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 1,465 | 735                | 1.2                    | 3.1                    | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 771   | 309                | 0.0                    | -0.7                   | a,b                 |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 843   | 293                | 0.2                    | -0.3                   | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 626   | 261                | -0.2                   | -1.5                   | b                   |
| Richness (No. of Taxa)                | ANOVA                         | log10                | NO                                  | 0.125   | 2007                            | 3               | 20.3  | 6.0                | -                      | 1.1                    | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 15.3  | 4.5                | -0.8                   | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 14.6  | 1.1                | -0.9                   | -0.2                   | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 17.0  | 1.6                | -0.5                   | 0.4                    | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 16.8  | 1.9                | -0.6                   | 0.3                    | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 14.4  | 1.1                | -1.0                   | -0.2                   | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 15.8  | 1.6                | -0.7                   | 0.1                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 17.4  | 3.1                | -0.5                   | 0.5                    | a                   |
| Simpson's Evenness                    | ANOVA                         | none                 | NO                                  | 0.276   | 2007                            | 3               | 0.864 | 0.040              | -                      | 0.0                    | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 0.864 | 0.025              | 0.0                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 0.889 | 0.044              | 0.6                    | 1.0                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 0.864 | 0.095              | 0.0                    | 0.0                    | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 0.874 | 0.033              | 0.3                    | 0.4                    | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 0.857 | 0.050              | -0.2                   | -0.3                   | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.755 | 0.161              | -2.7                   | -4.3                   | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 0.828 | 0.067              | -0.9                   | -1.4                   | a                   |
| Nemata (% of community)               | K-W                           | rank                 | NO                                  | 0.162   | 2007                            | 3               | 1.0   | 1.3                | -                      | 1.5                    | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 0.4   | 0.4                | -0.4                   | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 3.2   | 2.6                | 1.6                    | 7.2                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 4.5   | 4.1                | 2.6                    | 10.6                   | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 4.6   | 5.0                | 2.6                    | 10.8                   | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 2.6   | 1.8                | 1.2                    | 5.6                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 2.2   | 1.3                | 0.9                    | 4.7                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 2.1   | 1.0                | 0.8                    | 4.3                    | a                   |
| Oligochaeta (% of community)          | ANOVA                         | log10(x+1)           | YES                                 | 0.008   | 2007                            | 3               | 7.3   | 6.2                | -                      | 4.0                    | a,b,c               |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 1.1   | 1.6                | -1.0                   | -                      | a,c                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 5.6   | 3.1                | -0.3                   | 2.9                    | a,b,c               |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 9.7   | 3.7                | 0.4                    | 5.5                    | a,b                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 5.0   | 2.7                | -0.4                   | 2.5                    | a,b,c               |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 1.2   | 1.0                | -1.0                   | 0.1                    | c                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 4.0   | 2.7                | -0.5                   | 1.9                    | a,b,c               |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 11.5  | 8.4                | 0.7                    | 6.7                    | b                   |
| Hydracarina (% of community)          | K-W                           | rank                 | YES                                 | 0.007   | 2007                            | 3               | 2.9   | 1.4                | -                      | -3.4                   | a,c,d               |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 24.7  | 6.4                | 15.4                   | -                      | b                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 1.7   | 1.6                | -0.8                   | -3.6                   | d                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 4.6   | 0.8                | 1.2                    | -3.1                   | a,b                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 4.0   | 1.4                | 0.8                    | -3.2                   | a,c                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 3.6   | 1.5                | 0.5                    | -3.3                   | a,c,d               |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 2.3   | 1.4                | -0.4                   | -3.5                   | c,d                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 1.6   | 1.6                | -0.9                   | -3.6                   | d                   |
| Chironomidae (% of community)         | ANOVA                         | log10                | YES                                 | <0.001  | 2007                            | 3               | 80.8  | 8.5                | -                      | 1.7                    | a,b                 |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 65.3  | 9.0                | -1.8                   | -                      | c                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 85.2  | 4.0                | 0.5                    | 2.2                    | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 73.9  | 5.9                | -0.8                   | 1.0                    | b,c                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 80.9  | 4.5                | 0.0                    | 1.7                    | a,b                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 85.9  | 4.1                | 0.6                    | 2.3                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 87.4  | 7.4                | 0.8                    | 2.5                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 75.8  | 7.1                | -0.6                   | 1.2                    | a,b,c               |
| Metal Sensitive Taxa (% of community) | K-W                           | rank                 | YES                                 | 0.009   | 2007                            | 3               | 15.1  | 10.2               | -                      | 1.0                    | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 7.6   | 7.4                | -0.7                   | -                      | a,b,c               |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 4.4   | 3.5                | -1.0                   | -0.4                   | b,c                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 3.9   | 3.3                | -1.1                   | -0.5                   | c,d                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 1.5   | 0.7                | -1.3                   | -0.8                   | d                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 8.6   | 6.0                | -0.6                   | 0.1                    | a,b                 |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 7.7   | 3.4                | -0.7                   | 0.0                    | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 3.6   | 1.6                | -1.1                   | -0.5                   | b,c                 |
| Tipulidae (% of community)            | ANOVA                         | log10                | YES                                 | 0.082   | 2007                            | 3               | 6.5   | 2.6                | -                      | -0.6                   | a                   |
|                                       |                               |                      |                                     |         | 2011                            | 3               | 8.4   | 3.2                | 0.7                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 3.1   | 1.0                | -1.3                   | -1.7                   | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 6.1   | 3.4                | -0.1                   | -0.7                   | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 3.9   | 3.1                | -1.0                   | -1.4                   | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 4.9   | 3.1                | -0.6                   | -1.1                   | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 2.8   | 2.4                | -1.4                   | -1.8                   | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 6.2   | 2.0                | -0.1                   | -0.7                   | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.11: Statistical Comparison of Functional Feeding Group (FFG) Benthic Metrics at Camp Lake Tributary 1 Lower Main Stem (CLT1 DS) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | <0.0010 | 2007                            | 3               | 51.7 | 24.3               | -                      | 1.5                    | a,b                 |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 35.6 | 10.5               | -0.7                   | -                      | b                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 78.4 | 9.5                | 1.1                    | 4.1                    | c                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 73.8 | 9.9                | 0.9                    | 3.6                    | c,d                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 67.2 | 6.4                | 0.6                    | 3.0                    | a,c,d               |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 59.5 | 8.3                | 0.3                    | 2.3                    | a,d                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 81.5 | 6.3                | 1.2                    | 4.4                    | c                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 81.6 | 4.5                | 1.2                    | 4.4                    | c                   |
| Filterer FFG (% of community)           | K-W                           | rank                | NO                                  | 0.488   | 2007                            | 3               | 10.2 | 13.1               | -                      | 41.0                   | a                   |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 0.3  | 0.2                | -0.8                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.2  | 0.5                | -0.8                   | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 1.3  | 1.5                | -0.7                   | 4.3                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.3  | 0.5                | -0.8                   | 0.3                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.4  | 0.5                | -0.7                   | 0.6                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.8  | 1.9                | -0.7                   | 2.3                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.9  | 1.2                | -0.7                   | 2.7                    | a                   |
| Shredder FFG (% of community)           | ANOVA                         | log10               | YES                                 | <0.0010 | 2007                            | 3               | 22.1 | 3.1                | -                      | -3.7                   | a,b,c               |
|                                         |                               |                     |                                     |         | 2011                            | 3               | 38.9 | 4.6                | 5.5                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 19.3 | 9.0                | -0.9                   | -4.3                   | b,c                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 19.6 | 9.5                | -0.8                   | -4.2                   | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 27.6 | 4.9                | 1.8                    | -2.5                   | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 35.5 | 7.7                | 4.4                    | -0.7                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 13.9 | 6.1                | -2.7                   | -5.5                   | c                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 14.1 | 4.2                | -2.6                   | -5.5                   | c                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint values between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2020**

| Taxa                     | Study Area<br>Replicate Station | Upstream (CLT2-US) |    |     |    |    |
|--------------------------|---------------------------------|--------------------|----|-----|----|----|
|                          |                                 | B1                 | B2 | B3  | B4 | B5 |
| <hr/>                    |                                 |                    |    |     |    |    |
| <hr/>                    |                                 |                    |    |     |    |    |
| <b>ROUNDWORMS</b>        |                                 |                    |    |     |    |    |
| P. Nemata                |                                 | -                  | -  | 14  | 7  | -  |
| <b>ANNELIDS</b>          |                                 |                    |    |     |    |    |
| P. Annelida              |                                 |                    |    |     |    |    |
| <b>WORMS</b>             |                                 |                    |    |     |    |    |
| Cl. Oligochaeta          |                                 |                    |    |     |    |    |
| F. Enchytraeidae         |                                 | 215                | 14 | 505 | 7  | 11 |
| <b>ARTHROPODS</b>        |                                 |                    |    |     |    |    |
| P. Arthropoda            |                                 |                    |    |     |    |    |
| <b>MITES</b>             |                                 |                    |    |     |    |    |
| Cl. Arachnida            |                                 |                    |    |     |    |    |
| O. Acarina               |                                 |                    |    |     |    |    |
| F. Lebertiidae           |                                 |                    |    |     |    |    |
| Lebertia                 |                                 | -                  | -  | -   | -  | -  |
| F. Sperchonidae          |                                 |                    |    |     |    |    |
| Sperchon                 |                                 | 36                 | 14 | 14  | 18 | 11 |
| <b>SEED SHRIMPS</b>      |                                 |                    |    |     |    |    |
| Cl. Ostracoda            |                                 | -                  | 4  | -   | 4  | -  |
| <b>SPRINGTAILS</b>       |                                 |                    |    |     |    |    |
| Cl. Entognatha           |                                 |                    |    |     |    |    |
| O. Collembola            |                                 | -                  | -  | -   | -  | -  |
| <b>INSECTS</b>           |                                 |                    |    |     |    |    |
| Cl. Insecta              |                                 |                    |    |     |    |    |
| <b>MAYFLIES</b>          |                                 |                    |    |     |    |    |
| O. Ephemeroptera         |                                 |                    |    |     |    |    |
| F. Baetidae              |                                 |                    |    |     |    |    |
| Acentrella feropagus     |                                 | -                  | -  | -   | -  | -  |
| <b>STONEFLIES</b>        |                                 |                    |    |     |    |    |
| O. Plecoptera            |                                 |                    |    |     |    |    |
| F. Capniidae             |                                 |                    |    |     |    |    |
| immature                 |                                 | -                  | -  | 4   | 11 | -  |
| <b>TRUE FLIES</b>        |                                 |                    |    |     |    |    |
| O. Diptera               |                                 |                    |    |     |    |    |
| <b>BITING-MIDGE</b>      |                                 |                    |    |     |    |    |
| F. Ceratopogonidae       |                                 |                    |    |     |    |    |
| Culicoides               |                                 | 4                  | 61 | 4   | 25 | 11 |
| <b>MIDGES</b>            |                                 |                    |    |     |    |    |
| F. Chironomidae          |                                 |                    |    |     |    |    |
| chironomid pupae         |                                 | 100                | 22 | 79  | 57 | 54 |
| S.F. Chironominae        |                                 |                    |    |     |    |    |
| Micropsectra             |                                 | -                  | -  | -   | -  | -  |
| Paratanytarsus           |                                 | -                  | -  | -   | -  | -  |
| Rheotanytarsus           |                                 | -                  | -  | -   | -  | -  |
| S.F. Diamesinae          |                                 |                    |    |     |    |    |
| Diamesa                  |                                 | 11                 | -  | 11  | 32 | 14 |
| Pseudokiefferiella       |                                 | 36                 | 4  | 36  | 14 | 11 |
| S.F. Orthoclaadiinae     |                                 |                    |    |     |    |    |
| Cardiocladius            |                                 | -                  | -  | -   | -  | -  |
| Chaetocladius            |                                 | 11                 | -  | 4   | 4  | 11 |
| Corynoneura              |                                 | 4                  | -  | 4   | 4  | 4  |
| Cricotopus               |                                 | 50                 | 22 | 68  | 4  | 18 |
| Cricotopus/Orthoclaadius |                                 | 36                 | 14 | 39  | 14 | -  |
| Eukiefferiella           |                                 | 61                 | 65 | -   | 22 | 18 |

**Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2020**

| Taxa                                                         | Study Area<br>Replicate Station | Upstream (CLT2-US) |       |       |       |       |
|--------------------------------------------------------------|---------------------------------|--------------------|-------|-------|-------|-------|
|                                                              |                                 | B1                 | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                           |                                 | 4                  | -     | -     | -     | -     |
| <i>Hydrosmittia</i>                                          |                                 | 18                 | 22    | 72    | -     | 22    |
| <i>Krenosmittia</i>                                          |                                 | 43                 | 7     | 32    | 82    | 50    |
| <i>Limnophyes</i>                                            |                                 | -                  | -     | 7     | 7     | 14    |
| <i>Metriocnemus</i>                                          |                                 | -                  | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>                         |                                 | 168                | 18    | 151   | 86    | 183   |
| <i>Parakiefferiella</i>                                      |                                 | -                  | -     | -     | -     | -     |
| <i>Paraphaenocladius</i>                                     |                                 | -                  | -     | -     | -     | -     |
| <i>Psectrocladius</i>                                        |                                 | -                  | -     | -     | -     | -     |
| <i>Thienemanniella</i>                                       |                                 | -                  | -     | -     | -     | -     |
| <i>Tokunagaia</i>                                            |                                 | -                  | -     | -     | 11    | 4     |
| <i>Tvetenia</i>                                              |                                 | 75                 | 43    | 72    | 65    | 57    |
| indeterminate                                                |                                 | 4                  | -     | -     | 4     | 4     |
| <b>S.F. Podonominae</b>                                      |                                 |                    |       |       |       |       |
| <i>Trichotanytus</i>                                         |                                 | -                  | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                                      |                                 |                    |       |       |       |       |
| <i>Thienemannimyia</i> complex                               |                                 | -                  | -     | -     | -     | -     |
| <b>F. Empididae</b>                                          |                                 |                    |       |       |       |       |
| <i>Clinocera</i>                                             |                                 | 4                  | 7     | -     | 11    | -     |
| <b>F. Muscidae</b>                                           |                                 | -                  | -     | -     | -     | -     |
| <b>F. Simuliidae</b>                                         |                                 |                    |       |       |       |       |
| <i>Gymnopaia</i>                                             |                                 | 4                  | -     | -     | -     | 4     |
| <i>Metacnephia</i>                                           |                                 | -                  | -     | -     | -     | -     |
| <i>Prosimulium</i>                                           |                                 | 11                 | 7     | 4     | 4     | 22    |
| pupae                                                        |                                 | -                  | -     | -     | -     | -     |
| <b>F. Tipulidae</b>                                          |                                 |                    |       |       |       |       |
| <i>Dicranota</i>                                             |                                 | -                  | -     | -     | -     | -     |
| <i>Tipula</i>                                                |                                 | 11                 | 11    | 7     | 11    | 11    |
| <b>Number of Organisms (No. organisms per m<sup>2</sup>)</b> |                                 | 903                | 333   | 1,125 | 502   | 530   |
| <b>Richness (total number of taxa)<sup>a</sup></b>           |                                 | 18                 | 14    | 17    | 20    | 18    |
| <b>Simpson's Evenness (E)</b>                                |                                 | 0.894              | 0.939 | 0.791 | 0.914 | 0.856 |
| <b>Shannon-Wiener Diversity</b>                              |                                 | 3.166              | 3.286 | 2.629 | 3.457 | 3.179 |
| <b>Percent Composition</b>                                   |                                 |                    |       |       |       |       |
| % Nemata                                                     |                                 | 0.0                | 0.0   | 1.3   | 1.4   | 0.0   |
| % Oligochaeta                                                |                                 | 23.8               | 4.3   | 44.9  | 1.4   | 2.0   |
| % Hydracarina                                                |                                 | 4.0                | 4.3   | 1.3   | 3.6   | 2.0   |
| % Ostracods                                                  |                                 | 0.0                | 1.1   | 0.0   | 0.7   | 0.0   |
| % Ephemeroptera                                              |                                 | 0.0                | 0.0   | 0.0   | 0.0   | 0.0   |
| % Chironomids                                                |                                 | 68.7               | 64.5  | 51.0  | 80.7  | 87.2  |
| % Metal Sensitive Chironmids                                 |                                 | 6.2                | 1.2   | 4.8   | 10.8  | 5.4   |
| % Simuliidae                                                 |                                 | 1.6                | 2.2   | 0.3   | 0.7   | 4.7   |
| % Tipulidae                                                  |                                 | 1.2                | 3.2   | 0.6   | 2.1   | 2.0   |
| <b>Functional Feeding Group Composition</b>                  |                                 |                    |       |       |       |       |
| % Collector - Gatherers                                      |                                 | 84.7               | 60.1  | 88.9  | 83.3  | 85.4  |
| % Filterers                                                  |                                 | 1.2                | 2.2   | 0.3   | 0.7   | 4.1   |
| % Shredders                                                  |                                 | 8.9                | 13.0  | 9.2   | 5.3   | 5.8   |
| <b>Habitat Preference Group Composition</b>                  |                                 |                    |       |       |       |       |
| % Clingers                                                   |                                 | 13.7               | 18.4  | 9.9   | 7.4   | 10.6  |
| % Sprawlers                                                  |                                 | 60.9               | 55.8  | 43.0  | 82.6  | 83.3  |
| % Burrowers                                                  |                                 | 25.4               | 25.8  | 47.1  | 10.0  | 6.1   |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2020**

| Taxa                           | Study Area        | Downstream (CLT2-DS) |     |    |    |    |
|--------------------------------|-------------------|----------------------|-----|----|----|----|
|                                | Replicate Station | B1                   | B2  | B3 | B4 | B5 |
| <hr/>                          |                   |                      |     |    |    |    |
| <hr/>                          |                   |                      |     |    |    |    |
| <b>ROUNDWORMS</b>              |                   |                      |     |    |    |    |
| <b>P. Nemata</b>               |                   | 724                  | 4   | 7  | 4  | 7  |
| <b>ANNELIDS</b>                |                   |                      |     |    |    |    |
| <b>P. Annelida</b>             |                   |                      |     |    |    |    |
| <b>WORMS</b>                   |                   |                      |     |    |    |    |
| Cl. Oligochaeta                |                   |                      |     |    |    |    |
| <b>F. Enchytraeidae</b>        |                   | 229                  | 14  | 68 | 4  | -  |
| <b>ARTHROPODS</b>              |                   |                      |     |    |    |    |
| <b>P. Arthropoda</b>           |                   |                      |     |    |    |    |
| <b>MITES</b>                   |                   |                      |     |    |    |    |
| Cl. Arachnida                  |                   |                      |     |    |    |    |
| O. Acarina                     |                   |                      |     |    |    |    |
| <b>F. Lebertiidae</b>          |                   |                      |     |    |    |    |
| <i>Lebertia</i>                |                   | -                    | -   | -  | -  | -  |
| <b>F. Sperchonidae</b>         |                   |                      |     |    |    |    |
| <i>Sperchon</i>                |                   | 7                    | 36  | 18 | 14 | 43 |
| <b>SEED SHRIMPS</b>            |                   |                      |     |    |    |    |
| Cl. Ostracoda                  |                   | -                    | 4   | -  | 4  | -  |
| <b>SPRINGTAILS</b>             |                   |                      |     |    |    |    |
| Cl. Entognatha                 |                   |                      |     |    |    |    |
| O. Collembola                  |                   | -                    | -   | -  | -  | -  |
| <b>INSECTS</b>                 |                   |                      |     |    |    |    |
| Cl. Insecta                    |                   |                      |     |    |    |    |
| <b>MAYFLIES</b>                |                   |                      |     |    |    |    |
| O. Ephemeroptera               |                   |                      |     |    |    |    |
| <b>F. Baetidae</b>             |                   |                      |     |    |    |    |
| <i>Acentrella feropagus</i>    |                   | -                    | -   | -  | -  | -  |
| <b>STONEFLIES</b>              |                   |                      |     |    |    |    |
| O. Plecoptera                  |                   |                      |     |    |    |    |
| <b>F. Capniidae</b>            |                   |                      |     |    |    |    |
| immature                       |                   | -                    | 4   | -  | -  | 18 |
| <b>TRUE FLIES</b>              |                   |                      |     |    |    |    |
| O. Diptera                     |                   |                      |     |    |    |    |
| <b>BITING-MIDGE</b>            |                   |                      |     |    |    |    |
| <b>F. Ceratopogonidae</b>      |                   |                      |     |    |    |    |
| <i>Culicoides</i>              |                   | 14                   | -   | 11 | -  | 7  |
| <b>MIDGES</b>                  |                   |                      |     |    |    |    |
| <b>F. Chironomidae</b>         |                   |                      |     |    |    |    |
| chironomid pupae               |                   | 115                  | 100 | 75 | 36 | 47 |
| <b>S.F. Chironominae</b>       |                   |                      |     |    |    |    |
| <i>Micropsectra</i>            |                   | -                    | -   | -  | -  | -  |
| <i>Paratanytarsus</i>          |                   | -                    | -   | -  | -  | -  |
| <i>Rheotanytarsus</i>          |                   | -                    | 4   | -  | -  | -  |
| <b>S.F. Diamesinae</b>         |                   |                      |     |    |    |    |
| <i>Diamesa</i>                 |                   | 93                   | 82  | 75 | 14 | 39 |
| <i>Pseudokiefferiella</i>      |                   | 108                  | 7   | 25 | -  | 4  |
| <b>S.F. Orthocladiinae</b>     |                   |                      |     |    |    |    |
| <i>Cardiocladius</i>           |                   | -                    | -   | 22 | 14 | 7  |
| <i>Chaetocladius</i>           |                   | 50                   | 14  | 14 | 18 | 4  |
| <i>Corynoneura</i>             |                   | 7                    | 4   | -  | -  | -  |
| <i>Cricotopus</i>              |                   | 72                   | 57  | 54 | 57 | -  |
| <i>Cricotopus/Orthocladius</i> |                   | 50                   | 7   | 11 | 18 | 11 |
| <i>Eukiefferiella</i>          |                   | 36                   | 22  | 22 | 14 | -  |

**Table F.12: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake Tributary 2 Study Areas, August 2020**

| Taxa                                                         | Study Area<br>Replicate Station | Downstream (CLT2-DS) |       |       |       |       |
|--------------------------------------------------------------|---------------------------------|----------------------|-------|-------|-------|-------|
|                                                              |                                 | B1                   | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                           |                                 | -                    | 11    | -     | -     | -     |
| <i>Hydrosmittia</i>                                          |                                 | 14                   | 7     | 7     | -     | -     |
| <i>Krenosmittia</i>                                          |                                 | 14                   | 65    | 75    | 22    | -     |
| <i>Limnophyes</i>                                            |                                 | -                    | 18    | 14    | -     | -     |
| <i>Metriocnemus</i>                                          |                                 | -                    | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>                         |                                 | 165                  | 115   | 97    | 50    | 32    |
| <i>Parakiefferiella</i>                                      |                                 | -                    | -     | 7     | -     | -     |
| <i>Paraphaenocladius</i>                                     |                                 | -                    | 4     | -     | -     | -     |
| <i>Psectrocladius</i>                                        |                                 | -                    | -     | -     | -     | -     |
| <i>Thienemanniella</i>                                       |                                 | -                    | -     | -     | -     | -     |
| <i>Tokunagaia</i>                                            |                                 | 36                   | 90    | 25    | 32    | 36    |
| <i>Tvetenia</i>                                              |                                 | 194                  | 133   | 154   | 39    | 68    |
| indeterminate                                                |                                 | -                    | -     | -     | -     | -     |
| <b>S.F. Podonominae</b>                                      |                                 |                      |       |       |       |       |
| <i>Trichotanytus</i>                                         |                                 | -                    | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                                      |                                 |                      |       |       |       |       |
| <i>Thienemannimyia</i> complex                               |                                 | -                    | -     | -     | -     | -     |
| <b>F. Empididae</b>                                          |                                 |                      |       |       |       |       |
| <i>Clinocera</i>                                             |                                 | -                    | -     | 11    | -     | -     |
| <b>F. Muscidae</b>                                           |                                 | -                    | 4     | -     | -     | -     |
| <b>F. Simuliidae</b>                                         |                                 |                      |       |       |       |       |
| <i>Gymnopaia</i>                                             |                                 | 7                    | -     | 4     | -     | -     |
| <i>Metacnephia</i>                                           |                                 | 14                   | 11    | 7     | 4     | -     |
| <i>Prosimulium</i>                                           |                                 | 14                   | 32    | 22    | -     | 11    |
| pupae                                                        |                                 | -                    | 7     | -     | -     | -     |
| <b>F. Tipulidae</b>                                          |                                 |                      |       |       |       |       |
| <i>Dicranota</i>                                             |                                 | -                    | -     | 11    | -     | -     |
| <i>Tipula</i>                                                |                                 | 22                   | 11    | 39    | 4     | -     |
| <b>Number of Organisms (No. organisms per m<sup>2</sup>)</b> |                                 | 1,986                | 864   | 875   | 348   | 333   |
| <b>Richness (total number of taxa)<sup>a</sup></b>           |                                 | 19                   | 24    | 23    | 15    | 12    |
| <b>Simpson's Evenness (E)</b>                                |                                 | 0.863                | 0.935 | 0.946 | 0.935 | 0.927 |
| <b>Shannon-Wiener Diversity</b>                              |                                 | 3.095                | 3.676 | 3.839 | 3.308 | 3.024 |
| <b>Percent Composition</b>                                   |                                 |                      |       |       |       |       |
| % Nemata                                                     |                                 | 36.5                 | 0.4   | 0.8   | 1.0   | 2.2   |
| % Oligochaeta                                                |                                 | 11.6                 | 1.7   | 7.8   | 1.0   | 0.0   |
| % Hydracarina                                                |                                 | 0.4                  | 4.1   | 2.0   | 4.1   | 12.9  |
| % Ostracods                                                  |                                 | 0.0                  | 0.4   | 0.0   | 1.0   | 0.0   |
| % Ephemeroptera                                              |                                 | 0.0                  | 0.0   | 0.0   | 0.0   | 0.0   |
| % Chironomids                                                |                                 | 48.0                 | 85.5  | 77.5  | 90.7  | 74.2  |
| % Metal Sensitive Chironmids                                 |                                 | 11.5                 | 12.5  | 12.9  | 4.7   | 15.9  |
| % Simuliidae                                                 |                                 | 1.8                  | 5.8   | 3.7   | 1.0   | 3.2   |
| % Tipulidae                                                  |                                 | 1.1                  | 1.2   | 5.7   | 1.0   | 0.0   |
| <b>Functional Feeding Group Composition</b>                  |                                 |                      |       |       |       |       |
| % Collector - Gatherers                                      |                                 | 91.1                 | 79.5  | 75.9  | 67.5  | 73.7  |
| % Filterers                                                  |                                 | 1.4                  | 6.3   | 3.3   | 1.0   | 3.2   |
| % Shredders                                                  |                                 | 6.1                  | 9.7   | 11.9  | 22.7  | 5.4   |
| <b>Habitat Preference Group Composition</b>                  |                                 |                      |       |       |       |       |
| % Clingers                                                   |                                 | 7.1                  | 18.4  | 14.4  | 26.9  | 16.1  |
| % Sprawlers                                                  |                                 | 43.0                 | 77.8  | 68.5  | 65.4  | 76.9  |
| % Burrowers                                                  |                                 | 49.8                 | 3.7   | 17.1  | 7.7   | 7.0   |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.13: Benthic Station Habitat Feature Statistical Comparisons among Camp Lake Tributary 2 and Unnamed Reference Creek Study Areas, Mary River Project CREMP, August 2020**

| Metric                     | Overall 3-group Comparison    |                |                                       |         | Pair-wise, post-hoc comparisons |                 |                                       |         |
|----------------------------|-------------------------------|----------------|---------------------------------------|---------|---------------------------------|-----------------|---------------------------------------|---------|
|                            | Statistical Test <sup>a</sup> | Transformation | Significant Difference between Areas? | p-value | (I) Area                        | (J) Area        | Significant Difference Between Areas? | P-value |
| Water Depth (cm)           | ANOVA                         | none           | NO                                    | 0.362   | Unnamed Reference Creek         | CLT2 Upstream   | NO                                    | 0.342   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT2 Downstream | NO                                    | 0.477   |
|                            |                               |                |                                       |         | CLT2 Upstream                   | CLT2 Downstream | NO                                    | 0.481   |
| Water Velocity (cm/s)      | ANOVA                         | none           | NO                                    | 0.111   | Unnamed Reference Creek         | CLT2 Upstream   | NO                                    | 0.150   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT2 Downstream | NO                                    | 0.852   |
|                            |                               |                |                                       |         | CLT2 Upstream                   | CLT2 Downstream | NO                                    | 0.372   |
| Substrate Embeddedness (%) | ANOVA                         | none           | YES                                   | 0.056   | Unnamed Reference Creek         | CLT2 Upstream   | NO                                    | 0.374   |
|                            |                               |                |                                       |         | Unnamed Reference Creek         | CLT2 Downstream | NO                                    | 0.230   |
|                            |                               |                |                                       |         | CLT2 Upstream                   | CLT2 Downstream | YES                                   | 0.025   |

 Highlighted values indicate significant difference between study areas based on test p-value less than 0.10.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.14: Benthic Invertebrate Community Summary Statistics for Camp Lake Tributary 2 Study Areas, Mary River Project CREMP, August 2020**

| Metric                                              | Area                    | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|-----------------------------------------------------|-------------------------|-------|--------------------|----------------|---------|--------|---------|
| Density<br>(no. organisms / m <sup>2</sup> )        | Unnamed Reference Creek | 713   | 296                | 133            | 258     | 821    | 1,032   |
|                                                     | CLT2 Upstream           | 679   | 325                | 145            | 333     | 530    | 1,125   |
|                                                     | CLT2 Downstream         | 881   | 672                | 300            | 333     | 864    | 1,986   |
| Richness<br>(Number of Taxa)                        | Unnamed Reference Creek | 16.0  | 4.4                | 2.0            | 9.0     | 17.0   | 20.0    |
|                                                     | CLT2 Upstream           | 17.4  | 2.2                | 1.0            | 14.0    | 18.0   | 20.0    |
|                                                     | CLT2 Downstream         | 18.6  | 5.1                | 2.3            | 12.0    | 19.0   | 24.0    |
| Simpson's Evenness                                  | Unnamed Reference Creek | 0.840 | 0.043              | 0.019          | 0.767   | 0.856  | 0.878   |
|                                                     | CLT2 Upstream           | 0.879 | 0.058              | 0.026          | 0.791   | 0.894  | 0.939   |
|                                                     | CLT2 Downstream         | 0.921 | 0.033              | 0.015          | 0.863   | 0.935  | 0.946   |
| Nemata<br>(% of community)                          | Unnamed Reference Creek | 0.7%  | 1.3%               | 0.6%           | 0.0%    | 0.3%   | 3.0%    |
|                                                     | CLT2 Upstream           | 0.5%  | 0.7%               | 0.3%           | 0.0%    | 0.0%   | 1.4%    |
|                                                     | CLT2 Downstream         | 8.2%  | 15.8%              | 7.1%           | 0.4%    | 1.0%   | 36.5%   |
| Oligochaeta<br>(% of community)                     | Unnamed Reference Creek | 1.9%  | 1.5%               | 0.7%           | 0.8%    | 1.0%   | 4.2%    |
|                                                     | CLT2 Upstream           | 15.3% | 19.0%              | 8.5%           | 1.4%    | 4.3%   | 44.9%   |
|                                                     | CLT2 Downstream         | 4.4%  | 5.0%               | 2.3%           | 0.0%    | 1.7%   | 11.6%   |
| Hydracarina<br>(% of community)                     | Unnamed Reference Creek | 4.5%  | 3.7%               | 1.7%           | 2.1%    | 3.0%   | 11.1%   |
|                                                     | CLT2 Upstream           | 3.0%  | 1.3%               | 0.6%           | 1.3%    | 3.6%   | 4.3%    |
|                                                     | CLT2 Downstream         | 4.7%  | 4.8%               | 2.2%           | 0.4%    | 4.1%   | 12.9%   |
| Ostracoda<br>(% of community)                       | Unnamed Reference Creek | 30.6% | 11.7%              | 5.3%           | 16.7%   | 34.2%  | 42.0%   |
|                                                     | CLT2 Upstream           | 0.4%  | 0.5%               | 0.2%           | 0.0%    | 0.0%   | 1.1%    |
|                                                     | CLT2 Downstream         | 0.3%  | 0.5%               | 0.2%           | 0.0%    | 0.0%   | 1.0%    |
| Chironomidae<br>(% of community)                    | Unnamed Reference Creek | 48.3% | 12.9%              | 5.8%           | 36.7%   | 43.1%  | 67.3%   |
|                                                     | CLT2 Upstream           | 70.4% | 14.2%              | 6.3%           | 51.0%   | 68.7%  | 87.2%   |
|                                                     | CLT2 Downstream         | 75.2% | 16.5%              | 7.4%           | 48.0%   | 77.5%  | 90.7%   |
| Metal-Sensitive<br>Chironomidae<br>(% of community) | Unnamed Reference Creek | 0.8%  | 1.2%               | 0.6%           | 0.0%    | 0.5%   | 3.0%    |
|                                                     | CLT2 Upstream           | 5.7%  | 3.5%               | 1.5%           | 1.2%    | 5.4%   | 10.8%   |
|                                                     | CLT2 Downstream         | 11.5% | 4.2%               | 1.9%           | 4.7%    | 12.5%  | 15.9%   |
| Simuliidae<br>(% of community)                      | Unnamed Reference Creek | 9.8%  | 8.6%               | 3.8%           | 0.0%    | 8.7%   | 20.7%   |
|                                                     | CLT2 Upstream           | 1.9%  | 1.7%               | 0.8%           | 0.3%    | 1.6%   | 4.7%    |
|                                                     | CLT2 Downstream         | 3.1%  | 1.9%               | 0.8%           | 1.0%    | 3.2%   | 5.8%    |
| Tipulidae<br>(% of community)                       | Unnamed Reference Creek | 1.5%  | 2.3%               | 1.0%           | 0.0%    | 0.9%   | 5.6%    |
|                                                     | CLT2 Upstream           | 1.8%  | 1.0%               | 0.4%           | 0.6%    | 2.0%   | 3.2%    |
|                                                     | CLT2 Downstream         | 1.8%  | 2.2%               | 1.0%           | 0.0%    | 1.1%   | 5.7%    |
| Collector-Gatherer<br>FFG<br>(% of community)       | Unnamed Reference Creek | 80.7% | 8.8%               | 3.9%           | 70.0%   | 77.6%  | 91.1%   |
|                                                     | CLT2 Upstream           | 80.5% | 11.6%              | 5.2%           | 60.1%   | 84.8%  | 88.8%   |
|                                                     | CLT2 Downstream         | 77.5% | 8.7%               | 3.9%           | 67.5%   | 75.9%  | 91.0%   |
| Filterer FFG<br>(% of community)                    | Unnamed Reference Creek | 9.9%  | 8.9%               | 4.0%           | 0.0%    | 8.0%   | 21.5%   |
|                                                     | CLT2 Upstream           | 1.7%  | 1.5%               | 0.7%           | 0.3%    | 1.2%   | 4.1%    |
|                                                     | CLT2 Downstream         | 3.1%  | 2.1%               | 0.9%           | 1.0%    | 3.2%   | 6.3%    |
| Shredder FFG<br>(% of community)                    | Unnamed Reference Creek | 2.8%  | 2.7%               | 1.2%           | 0.0%    | 2.4%   | 7.0%    |
|                                                     | CLT2 Upstream           | 8.5%  | 3.1%               | 1.4%           | 5.3%    | 8.9%   | 13.0%   |
|                                                     | CLT2 Downstream         | 11.2% | 7.0%               | 3.1%           | 5.4%    | 9.7%   | 22.7%   |
| Clinger HPG<br>(% of community)                     | Unnamed Reference Creek | 15.8% | 7.7%               | 3.5%           | 7.8%    | 12.6%  | 27.0%   |
|                                                     | CLT2 Upstream           | 12.0% | 4.2%               | 1.9%           | 7.4%    | 10.6%  | 18.4%   |
|                                                     | CLT2 Downstream         | 16.6% | 7.1%               | 3.2%           | 7.1%    | 16.1%  | 26.9%   |
| Sprawler HPG<br>(% of community)                    | Unnamed Reference Creek | 79.4% | 6.6%               | 3.0%           | 70.0%   | 79.1%  | 87.2%   |
|                                                     | CLT2 Upstream           | 65.1% | 17.6%              | 7.9%           | 43.0%   | 60.9%  | 83.3%   |
|                                                     | CLT2 Downstream         | 66.3% | 14.1%              | 6.3%           | 43.0%   | 68.5%  | 77.8%   |
| Burrower HPG<br>(% of community)                    | Unnamed Reference Creek | 4.8%  | 3.3%               | 1.5%           | 1.4%    | 3.1%   | 8.3%    |
|                                                     | CLT2 Upstream           | 22.9% | 16.2%              | 7.3%           | 6.1%    | 25.4%  | 47.1%   |
|                                                     | CLT2 Downstream         | 17.1% | 19.0%              | 8.5%           | 3.7%    | 7.8%   | 49.8%   |

Note: Sample size equals five for all study areas.



**Table F.15: Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Tributary 2 Upstream (CLT2 US) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                            | Overall 7-Year Comparison     |                      |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------|-------------------------------|----------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                   | Statistical Test <sup>a</sup> | Data Transform-ation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> ) | ANOVA                         | log10                | YES                                 | <0.001  | 2007                                         | 3               | 364   | 205                | -                                  | a,b,c               |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 741   | 416                | 1.8                                | a                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 412   | 100                | 0.2                                | a,b,c               |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 216   | 30                 | -0.7                               | b,c                 |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 168   | 65                 | -1.0                               | c                   |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 745   | 282                | 1.9                                | a                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 679   | 325                | 1.5                                | a                   |
| Richness (No. of Taxa)            | ANOVA                         | log10                | YES                                 | 0.003   | 2007                                         | 3               | 12.7  | 2.1                | -                                  | a                   |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 20.8  | 1.8                | 3.9                                | b                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 17.2  | 3.0                | 2.2                                | a,b,c               |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 14.6  | 2.5                | 0.9                                | a,c                 |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 15.0  | 3.7                | 1.1                                | a,c                 |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 18.8  | 2.6                | 2.9                                | b,c                 |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 17.4  | 2.2                | 2.3                                | a,b,c               |
| Simpson's Evenness                | K-W                           | rank                 | YES                                 | 0.003   | 2007                                         | 3               | 0.825 | 0.008              | -                                  | a                   |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 0.922 | 0.025              | 11.9                               | b,c                 |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 0.898 | 0.035              | 8.9                                | a,c                 |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 0.955 | 0.013              | 15.9                               | b                   |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 0.922 | 0.043              | 11.9                               | b,c                 |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 0.949 | 0.005              | 15.2                               | b                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 0.879 | 0.058              | 6.6                                | a,c                 |
| Nemata (% of community)           | K-W                           | rank                 | NO                                  | 0.255   | 2007                                         | 3               | 1.1   | 0.6                | -                                  | a                   |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 0.9   | 0.9                | -0.5                               | a                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 1.0   | 0.8                | -0.3                               | a                   |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 1.0   | 1.4                | -0.3                               | a                   |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 1.1   | 1.6                | 0.0                                | a                   |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 2.4   | 1.0                | 2.2                                | a                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 0.5   | 0.7                | -1.0                               | a                   |
| Oligochaeta (% of community)      | K-W                           | rank                 | NO                                  | 0.406   | 2007                                         | 3               | 2.1   | 0.8                | -                                  | a                   |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 2.7   | 2.8                | 0.7                                | a                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 4.9   | 3.5                | 3.5                                | a                   |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 3.4   | 6.5                | 1.6                                | a                   |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 2.4   | 3.4                | 0.4                                | a                   |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 2.4   | 1.0                | 0.4                                | a                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 15.3  | 19.0               | 16.7                               | a                   |
| Hydracarina (% of community)      | ANOVA                         | log10(x+1)           | YES                                 | 0.007   | 2007                                         | 3               | 2.9   | 2.1                | -                                  | a,b                 |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 0.9   | 0.7                | -1.0                               | b                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 5.5   | 2.6                | 1.2                                | a,b                 |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 8.0   | 4.2                | 2.4                                | a                   |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 4.7   | 4.4                | 0.8                                | a,b                 |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 1.6   | 1.5                | -0.6                               | b                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 3.0   | 1.3                | 0.0                                | a,b                 |
| Chironomidae (% of community)     | ANOVA                         | none                 | NO                                  | 0.181   | 2007                                         | 3               | 88.4  | 4.3                | -                                  | a                   |
|                                   |                               |                      |                                     |         | 2015                                         | 5               | 80.2  | 8.9                | -1.9                               | a                   |
|                                   |                               |                      |                                     |         | 2016                                         | 5               | 79.5  | 8.6                | -2.1                               | a                   |
|                                   |                               |                      |                                     |         | 2017                                         | 5               | 75.9  | 7.5                | -2.9                               | a                   |
|                                   |                               |                      |                                     |         | 2018                                         | 5               | 80.2  | 3.9                | -1.9                               | a                   |
|                                   |                               |                      |                                     |         | 2019                                         | 5               | 80.0  | 5.9                | -2.0                               | a                   |
|                                   |                               |                      |                                     |         | 2020                                         | 5               | 70.4  | 14.2               | -4.2                               | a                   |

**Table F.15: Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Tributary 2 Upstream (CLT2 US) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                      |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|----------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transform-ation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Metal Sensitive Taxa (% of community)   | ANOVA                         | none                 | YES                                 | <0.001  | 2007                                         | 3               | 5.3  | 0.6                | -                                  | a                   |
|                                         |                               |                      |                                     |         | 2015                                         | 5               | 10.5 | 5.7                | 8.7                                | a,b                 |
|                                         |                               |                      |                                     |         | 2016                                         | 5               | 5.3  | 3.3                | 0.0                                | a                   |
|                                         |                               |                      |                                     |         | 2017                                         | 5               | 22.0 | 3.1                | 28.2                               | c                   |
|                                         |                               |                      |                                     |         | 2018                                         | 5               | 9.5  | 5.0                | 7.1                                | a,b                 |
|                                         |                               |                      |                                     |         | 2019                                         | 5               | 17.0 | 6.6                | 19.7                               | b,c                 |
|                                         |                               |                      |                                     |         | 2020                                         | 5               | 5.7  | 3.5                | 0.6                                | a                   |
| Tipulidae (% of community)              | ANOVA                         | log10(x+1)           | YES                                 | 0.042   | 2007                                         | 3               | 5.2  | 2.0                | -                                  | a                   |
|                                         |                               |                      |                                     |         | 2015                                         | 5               | 4.1  | 3.5                | -0.5                               | a                   |
|                                         |                               |                      |                                     |         | 2016                                         | 5               | 4.0  | 1.8                | -0.6                               | a                   |
|                                         |                               |                      |                                     |         | 2017                                         | 5               | 1.6  | 1.6                | -1.8                               | a                   |
|                                         |                               |                      |                                     |         | 2018                                         | 5               | 2.3  | 1.5                | -1.5                               | a                   |
|                                         |                               |                      |                                     |         | 2019                                         | 5               | 1.6  | 0.6                | -1.8                               | a                   |
|                                         |                               |                      |                                     |         | 2020                                         | 5               | 1.8  | 1.0                | -1.7                               | a                   |
| Collector-Gatherer FFG (% of community) | K-W                           | rank                 | YES                                 | 0.008   | 2007                                         | 3               | 68.5 | 6.5                | -                                  | a,b,c               |
|                                         |                               |                      |                                     |         | 2015                                         | 5               | 63.8 | 10.3               | -0.7                               | c,d                 |
|                                         |                               |                      |                                     |         | 2016                                         | 5               | 66.6 | 5.8                | -0.3                               | b,c                 |
|                                         |                               |                      |                                     |         | 2017                                         | 5               | 75.6 | 3.9                | 1.1                                | a,b                 |
|                                         |                               |                      |                                     |         | 2018                                         | 5               | 73.2 | 8.6                | 0.7                                | a,b,c               |
|                                         |                               |                      |                                     |         | 2019                                         | 5               | 54.0 | 6.0                | -2.2                               | d                   |
|                                         |                               |                      |                                     |         | 2020                                         | 5               | 80.5 | 11.6               | 1.8                                | a                   |
| Filterer FFG (% of community)           | ANOVA                         | log10(x+1)           | YES                                 | <0.001  | 2007                                         | 3               | 0.3  | 0.4                | -                                  | a                   |
|                                         |                               |                      |                                     |         | 2015                                         | 5               | 1.0  | 1.1                | 1.7                                | a                   |
|                                         |                               |                      |                                     |         | 2016                                         | 5               | 0.2  | 0.4                | -0.2                               | a                   |
|                                         |                               |                      |                                     |         | 2017                                         | 5               | 6.5  | 3.1                | 14.4                               | b,c                 |
|                                         |                               |                      |                                     |         | 2018                                         | 5               | 6.6  | 5.5                | 14.7                               | b,c                 |
|                                         |                               |                      |                                     |         | 2019                                         | 5               | 11.3 | 3.7                | 25.6                               | b                   |
|                                         |                               |                      |                                     |         | 2020                                         | 5               | 1.7  | 1.5                | 3.3                                | a,c                 |
| Shredder FFG (% of community)           | ANOVA                         | log10(x+1)           | YES                                 | <0.001  | 2007                                         | 3               | 27.6 | 5.8                | -                                  | a                   |
|                                         |                               |                      |                                     |         | 2015                                         | 5               | 26.2 | 5.9                | -0.2                               | a                   |
|                                         |                               |                      |                                     |         | 2016                                         | 5               | 25.9 | 4.4                | -0.3                               | a                   |
|                                         |                               |                      |                                     |         | 2017                                         | 5               | 7.4  | 5.9                | -3.5                               | b                   |
|                                         |                               |                      |                                     |         | 2018                                         | 5               | 12.9 | 5.3                | -2.5                               | b,c                 |
|                                         |                               |                      |                                     |         | 2019                                         | 5               | 21.9 | 5.8                | -1.0                               | a,c                 |
|                                         |                               |                      |                                     |         | 2020                                         | 5               | 8.5  | 3.1                | -3.3                               | b                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.16:** Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Tributary 2 Downstream (CLT2 DS) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP

| Metric                            | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                   | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> ) | ANOVA                         | log10               | YES                                 | 0.002   | 2007                                         | 3               | 431   | 109                | -                                  | a,b,c               |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 447   | 258                | 0.1                                | a,b                 |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 205   | 61                 | -2.1                               | b,c                 |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 222   | 144                | -1.9                               | b,c                 |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 127   | 51                 | -2.8                               | c                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 546   | 366                | 1.1                                | a,b                 |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 881   | 672                | 4.1                                | a                   |
| Richness (No. of Taxa)            | ANOVA                         | none                | YES                                 | 0.029   | 2007                                         | 3               | 17.7  | 2.1                | -                                  | a,b                 |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 14.2  | 3.4                | -1.7                               | a,b                 |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 14.0  | 4.0                | -1.8                               | a,b                 |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 13.2  | 4.7                | -2.2                               | a,b                 |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 11.2  | 1.9                | -3.1                               | b                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 18.4  | 3.1                | 0.3                                | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 18.6  | 5.1                | 0.4                                | a                   |
| Simpson's Evenness                | K-W                           | rank                | YES                                 | 0.075   | 2007                                         | 3               | 0.865 | 0.017              | -                                  | a,b                 |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.934 | 0.034              | 4.0                                | c                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 0.838 | 0.079              | -1.6                               | b                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 0.913 | 0.052              | 2.8                                | a,c,d               |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 0.908 | 0.087              | 2.5                                | c,d                 |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 0.885 | 0.048              | 1.1                                | a,b,c               |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 0.921 | 0.033              | 3.2                                | c,d                 |
| Nemata (% of community)           | K-W                           | rank                | NO                                  | 0.643   | 2007                                         | 3               | 1.1   | 1.2                | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 4.2   | 2.4                | 2.6                                | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 2.0   | 2.4                | 0.8                                | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 3.2   | 4.4                | 1.8                                | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 2.7   | 3.0                | 1.4                                | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 2.6   | 1.8                | 1.2                                | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 8.2   | 15.8               | 5.9                                | a                   |
| Oligochaeta (% of community)      | K-W                           | rank                | NO                                  | 0.486   | 2007                                         | 3               | 2.6   | 0.6                | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 8.8   | 12.8               | 10.1                               | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 1.9   | 3.2                | -1.1                               | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 4.8   | 6.9                | 3.7                                | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 1.1   | 2.5                | -2.3                               | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 4.3   | 3.3                | 2.8                                | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 4.4   | 5.0                | 3.0                                | a                   |
| Hydracarina (% of community)      | K-W                           | rank                | YES                                 | 0.091   | 2007                                         | 3               | 1.8   | 1.2                | -                                  | a,b                 |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.3   | 0.6                | -1.2                               | b                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 4.5   | 1.9                | 2.2                                | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 3.3   | 4.0                | 1.3                                | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 3.5   | 4.0                | 1.4                                | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 2.1   | 0.7                | 0.3                                | b                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 4.7   | 4.8                | 2.4                                | a                   |
| Chironomidae (% of community)     | K-W                           | rank                | NO                                  | 0.469   | 2007                                         | 3               | 88.0  | 6.0                | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 75.6  | 10.4               | -2.1                               | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 82.4  | 6.3                | -0.9                               | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 81.8  | 8.4                | -1.0                               | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 84.1  | 6.0                | -0.7                               | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 84.7  | 3.5                | -0.6                               | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 75.2  | 16.5               | -2.1                               | a                   |

**Table F.16:** Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Tributary 2 Downstream (CLT2 DS) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Metal Sensitive Taxa (% of community)   | K-W                           | rank                | YES                                 | 0.032   | 2007                                         | 3               | 11.8 | 2.0                | -                                  | a,b,c               |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 10.6 | 10.6               | -0.6                               | b,c                 |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 5.4  | 0.9                | -3.3                               | c                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 20.2 | 12.6               | 4.3                                | a,b                 |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 8.0  | 7.0                | -1.9                               | b,c                 |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 23.3 | 10.1               | 5.9                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 11.5 | 4.2                | -0.2                               | a,b,c               |
| Tipulidae (% of community)              | ANOVA                         | log10(x+1)          | NO                                  | 0.116   | 2007                                         | 3               | 6.5  | 6.6                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 5.8  | 5.1                | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 2.2  | 1.6                | -0.6                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 0.8  | 1.9                | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 2.6  | 2.4                | -0.6                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 1.7  | 1.4                | -0.7                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 1.8  | 2.2                | -0.7                               | a                   |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.059   | 2007                                         | 3               | 66.4 | 11.0               | -                                  | a,b                 |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 69.3 | 10.9               | 0.3                                | a,b                 |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 77.6 | 11.6               | 1.0                                | a,b                 |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 77.1 | 10.5               | 1.0                                | a,b                 |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 83.4 | 6.5                | 1.5                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 56.8 | 23.0               | -0.9                               | b                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 77.5 | 8.7                | 1.0                                | a,b                 |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.005   | 2007                                         | 3               | 2.7  | 1.9                | -                                  | a,b,c,d             |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 0.8  | 0.9                | -1.0                               | c,d                 |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 1.1  | 1.0                | -0.9                               | b,c,d               |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 3.5  | 3.1                | 0.4                                | b,d                 |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 0.9  | 2.1                | -1.0                               | c                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 15.4 | 11.3               | 6.7                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 3.1  | 2.1                | 0.2                                | a,b                 |
| Shredder FFG (% of community)           | ANOVA                         | log10(x+1)          | NO                                  | 0.130   | 2007                                         | 3               | 21.5 | 6.0                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 25.7 | 11.6               | 0.7                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 13.8 | 10.4               | -1.3                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 14.6 | 8.9                | -1.2                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 7.7  | 7.3                | -2.3                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 21.0 | 16.9               | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 11.2 | 7.0                | -1.7                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

Note: "-" indicates no data applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.17: Statistical Comparison of Physical Sediment Quality Between Littoral and Profundal Stations of Reference Lake 3, Mary River Project CREMP, August 2020**

| Habitat Variable                   | Statistical Test Results          |                |                                       |         | Summary Statistics |                   |      |                    |                |         |         |
|------------------------------------|-----------------------------------|----------------|---------------------------------------|---------|--------------------|-------------------|------|--------------------|----------------|---------|---------|
|                                    | Statistical Analysis <sup>a</sup> | Transformation | Significant Difference Between Areas? | P-value | Station Type       | Sample Size ( n ) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Sand-Sized Particles (% by weight) | tequal                            | none           | NO                                    | 0.854   | Littoral           | 5                 | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                                    |                                   |                |                                       |         | Profundal          | 5                 | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
| Silt-Sized Particles (% by weight) | tequal                            | none           | NO                                    | 0.590   | Littoral           | 5                 | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                                    |                                   |                |                                       |         | Profundal          | 5                 | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
| Clay-Sized Particles (% by weight) | tequal                            | none           | NO                                    | 0.266   | Littoral           | 5                 | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                                    |                                   |                |                                       |         | Profundal          | 5                 | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
| Moisture (% by weight)             | tequal                            | none           | YES                                   | 0.078   | Littoral           | 5                 | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                                    |                                   |                |                                       |         | Profundal          | 5                 | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
| Total Organic Carbon (%)           | tequal                            | none           | NO                                    | 0.205   | Littoral           | 5                 | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                                    |                                   |                |                                       |         | Profundal          | 5                 | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |

 Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table F.18: Statistical Comparison of Sediment Physical Properties Between Camp Lake and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results      |                     |                                       |         | Summary Statistics |                 |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-------------------------------|---------------------|---------------------------------------|---------|--------------------|-----------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference between Areas? | P-value | Study Lake         | Sample Size (n) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Station Depth (m)                      | tequal                        | log10               | NO                                    | 0.310   | Reference          | 5               | 9.4  | 1.4                | 0.6            | 7.3     | 10.6    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 8.3  | 1.9                | 0.8            | 7.0     | 11.3    |
|                             | Sand-Sized Material (%)                | tequal                        | none                | YES                                   | 0.006   | Reference          | 5               | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 65.4 | 20.1               | 9.0            | 41.1    | 85.0    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | YES                                   | 0.008   | Reference          | 5               | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 32.1 | 18.2               | 8.2            | 14.2    | 55.1    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | YES                                   | 0.008   | Reference          | 5               | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 2.6  | 2.0                | 0.9            | 1.0     | 5.5     |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.006   | Reference          | 5               | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 57.3 | 17.9               | 8.0            | 37.7    | 81.7    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.011   | Reference          | 5               | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 1.4  | 1.2                | 0.5            | 0.3     | 3.4     |
| Profundal (Deep) Stations   | Station Depth (m)                      | tequal                        | none                | YES                                   | 0.009   | Reference          | 5               | 19.3 | 2.5                | 1.1            | 16.0    | 21.9    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 26.6 | 4.1                | 1.8            | 21.2    | 31.0    |
|                             | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.253   | Reference          | 5               | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 52.8 | 31.4               | 14.0           | 18.3    | 86.8    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.270   | Reference          | 5               | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 40.4 | 26.6               | 11.9           | 11.8    | 69.4    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.195   | Reference          | 5               | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 6.9  | 5.0                | 2.2            | 1.4     | 12.3    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.024   | Reference          | 5               | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 55.4 | 21.7               | 9.7            | 26.4    | 74.4    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.022   | Reference          | 5               | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                               |                     |                                       |         | Camp               | 5               | 1.4  | 1.2                | 0.5            | 0.3     | 3.1     |

Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table F.19: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2020**

| Taxa                      | Study Area<br>Replicate Station | Reference Lake 03 - Littoral Stations |        |        |        |        |
|---------------------------|---------------------------------|---------------------------------------|--------|--------|--------|--------|
|                           |                                 | REF-01                                | REF-02 | REF-03 | REF-04 | REF-05 |
| <b>ROUNDWORMS</b>         |                                 |                                       |        |        |        |        |
| P. Nemata                 |                                 | 26                                    | 34     | 112    | 103    | 9      |
| <b><u>ANNELIDS</u></b>    |                                 |                                       |        |        |        |        |
| P. Annelida               |                                 |                                       |        |        |        |        |
| <b>WORMS</b>              |                                 |                                       |        |        |        |        |
| Cl. Oligochaeta           |                                 |                                       |        |        |        |        |
| F. Enchytraeidae          |                                 | -                                     | -      | -      | -      | -      |
| F. Lumbriculidae          |                                 |                                       |        |        |        |        |
| <i>Lumbriculus</i>        |                                 | -                                     | -      | -      | -      | -      |
| <b><u>ARTHROPODS</u></b>  |                                 |                                       |        |        |        |        |
| P. Arthropoda             |                                 |                                       |        |        |        |        |
| <b>MITES</b>              |                                 |                                       |        |        |        |        |
| Cl. Arachnida             |                                 |                                       |        |        |        |        |
| O. Acarina                |                                 |                                       |        |        |        |        |
| immature                  |                                 | -                                     | -      | -      | -      | -      |
| F. Acalyptonotidae        |                                 |                                       |        |        |        |        |
| <i>Acalyptonotus</i>      |                                 | 26                                    | 17     | -      | -      | 17     |
| F. Hygrobatiidae          |                                 |                                       |        |        |        |        |
| <i>Hygrobates</i>         |                                 | 60                                    | 86     | 17     | 9      | 9      |
| F. Lebertiidae            |                                 |                                       |        |        |        |        |
| <i>Lebertia</i>           |                                 | 52                                    | -      | 34     | 43     | 34     |
| F. Sperchontidae          |                                 |                                       |        |        |        |        |
| <i>Sperchon</i>           |                                 | -                                     | -      | -      | -      | -      |
| <b>HARPACTICOIDS</b>      |                                 |                                       |        |        |        |        |
| O. Harpacticoida          |                                 | -                                     | -      | -      | -      | -      |
| <b>SEED SHRIMPS</b>       |                                 |                                       |        |        |        |        |
| Cl. Ostracoda             |                                 | 371                                   | 638    | 431    | 922    | 543    |
| <b><u>INSECTS</u></b>     |                                 |                                       |        |        |        |        |
| Cl. Insecta               |                                 |                                       |        |        |        |        |
| <b>CADDISFLIES</b>        |                                 |                                       |        |        |        |        |
| O. Trichoptera            |                                 |                                       |        |        |        |        |
| F. Apataniidae            |                                 |                                       |        |        |        |        |
| <i>Apatania</i>           |                                 | -                                     | -      | -      | -      | -      |
| F. Limnephilidae          |                                 |                                       |        |        |        |        |
| <i>Grensia praeterita</i> |                                 | 9                                     | -      | -      | -      | -      |
| <b><u>TRUE FLIES</u></b>  |                                 |                                       |        |        |        |        |
| O. Diptera                |                                 |                                       |        |        |        |        |
| <b>MIDGES</b>             |                                 |                                       |        |        |        |        |
| F. Chironomidae           |                                 |                                       |        |        |        |        |
| chironomid pupae          |                                 | 52                                    | 86     | 78     | 26     | 121    |
| S.F. Chironominae         |                                 |                                       |        |        |        |        |
| <i>Chironomus</i>         |                                 | -                                     | -      | -      | -      | -      |
| <i>Micropsectra</i>       |                                 | 147                                   | 690    | 267    | 164    | 440    |

**Table F.19: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Reference Lake 03 - Littoral Stations |        |        |        |        |
|----------------------------------------------------|---------------------------------|---------------------------------------|--------|--------|--------|--------|
|                                                    |                                 | REF-01                                | REF-02 | REF-03 | REF-04 | REF-05 |
| <i>Paratanytarsus</i>                              |                                 | 17                                    | 17     | -      | -      | -      |
| <i>Sergentia</i>                                   |                                 | -                                     | -      | -      | -      | -      |
| <i>Stictochironomus</i>                            |                                 | 52                                    | 328    | 9      | 9      | 43     |
| <i>Tanytarsus</i>                                  |                                 | 95                                    | 121    | 34     | 34     | -      |
| <b>S.F. Diamesinae</b>                             |                                 |                                       |        |        |        |        |
| <i>Diamesa</i>                                     |                                 | -                                     | -      | -      | -      | -      |
| <i>Protanypus</i>                                  |                                 | 26                                    | 17     | 26     | 9      | 9      |
| <i>Pseudodiamesa</i>                               |                                 | 9                                     | -      | 9      | 9      | -      |
| <b>S.F. Orthoclaadiinae</b>                        |                                 |                                       |        |        |        |        |
| <i>Abiskomyia</i>                                  |                                 | 181                                   | 86     | 69     | 52     | 60     |
| <i>Heterotrissocladius</i>                         |                                 | 26                                    | 69     | 52     | 34     | 69     |
| <i>Hydrobaenus</i>                                 |                                 | -                                     | -      | -      | -      | -      |
| <i>Mesocricotopus</i>                              |                                 | -                                     | -      | -      | -      | -      |
| <i>Paracladius</i>                                 |                                 | 95                                    | -      | 43     | 43     | -      |
| <i>Parakiefferiella</i>                            |                                 | 9                                     | -      | -      | -      | 9      |
| <i>Psectrocladius</i>                              |                                 | 17                                    | 34     | -      | 9      | 34     |
| <i>Zalutschia</i>                                  |                                 | 86                                    | 69     | 9      | 9      | 95     |
| Orthoclaadiinae indeterminate                      |                                 | -                                     | -      | -      | -      | -      |
| <b>S.F. Tanypodinae</b>                            |                                 |                                       |        |        |        |        |
| <i>Arctopelopia</i>                                |                                 | -                                     | 17     | -      | -      | -      |
| <i>Procladius</i>                                  |                                 | 34                                    | -      | -      | -      | -      |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 1,388                                 | 2,310  | 1,190  | 1,474  | 1,491  |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 19                                    | 14     | 13     | 14     | 13     |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.923                                 | 0.853  | 0.847  | 0.630  | 0.799  |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.510                                 | 2.760  | 2.730  | 2.079  | 2.457  |
| <b>Dominant Taxonomic Group Composition</b>        |                                 |                                       |        |        |        |        |
| % Nemata                                           |                                 | 1.9                                   | 1.5    | 9.4    | 7.0    | 0.6    |
| % Hydracarina                                      |                                 | 9.9                                   | 4.5    | 4.3    | 3.5    | 4.0    |
| % Ostracods                                        |                                 | 26.7                                  | 27.6   | 36.2   | 62.6   | 36.4   |
| % Chironomids                                      |                                 | 60.9                                  | 66.4   | 50.0   | 26.9   | 59.0   |
| % Metal Sensitive Chironmids                       |                                 | 22.5                                  | 38.7   | 32.5   | 15.6   | 34.8   |
| <b>Functional Feeding Group Composition</b>        |                                 |                                       |        |        |        |        |
| % Collector - Gatherers                            |                                 | 60.3                                  | 53.6   | 65.7   | 81.5   | 54.4   |
| % Filterers                                        |                                 | 19.8                                  | 38.0   | 29.2   | 14.4   | 34.2   |
| % Shredders                                        |                                 | 7.2                                   | 3.2    | 0.8    | 0.6    | 7.4    |
| <b>Habitat Preference Group Composition</b>        |                                 |                                       |        |        |        |        |
| % Clingers                                         |                                 | 28.5                                  | 41.6   | 33.5   | 17.9   | 38.2   |
| % Sprawlers                                        |                                 | 63.7                                  | 41.1   | 53.7   | 73.8   | 57.2   |
| % Burrowers                                        |                                 | 7.8                                   | 17.3   | 12.8   | 8.3    | 4.6    |

<sup>a</sup> Bold entries excluded from taxa count



**Table F.19: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2020**

| Taxa                      | Study Area        | Reference Lake 03 - Profundal Stations |        |        |        |        |
|---------------------------|-------------------|----------------------------------------|--------|--------|--------|--------|
|                           | Replicate Station | REF-06                                 | REF-07 | REF-08 | REF-09 | REF-10 |
| <hr/>                     |                   |                                        |        |        |        |        |
| <b>ROUNDWORMS</b>         |                   |                                        |        |        |        |        |
| P. Nemata                 |                   | -                                      | -      | 9      | -      | 9      |
| <b><u>ANNELIDS</u></b>    |                   |                                        |        |        |        |        |
| P. Annelida               |                   |                                        |        |        |        |        |
| <b>WORMS</b>              |                   |                                        |        |        |        |        |
| Cl. Oligochaeta           |                   |                                        |        |        |        |        |
| F. Enchytraeidae          |                   | -                                      | -      | -      | -      | -      |
| F. Lumbriculidae          |                   |                                        |        |        |        |        |
| <i>Lumbriculus</i>        |                   | -                                      | -      | -      | -      | -      |
| <b><u>ARTHROPODS</u></b>  |                   |                                        |        |        |        |        |
| P. Arthropoda             |                   |                                        |        |        |        |        |
| <b>MITES</b>              |                   |                                        |        |        |        |        |
| Cl. Arachnida             |                   |                                        |        |        |        |        |
| O. Acarina                |                   |                                        |        |        |        |        |
| immature                  |                   | -                                      | -      | -      | -      | -      |
| F. Acalyptonotidae        |                   |                                        |        |        |        |        |
| <i>Acalyptonotus</i>      |                   | 9                                      | -      | 9      | -      | -      |
| F. Hygrobatidae           |                   |                                        |        |        |        |        |
| <i>Hygrobates</i>         |                   | -                                      | -      | -      | -      | -      |
| F. Lebertiidae            |                   |                                        |        |        |        |        |
| <i>Lebertia</i>           |                   | 9                                      | -      | 9      | 26     | 9      |
| F. Sperchontidae          |                   |                                        |        |        |        |        |
| <i>Sperchon</i>           |                   | -                                      | -      | -      | -      | -      |
| <b>HARPACTICIDS</b>       |                   |                                        |        |        |        |        |
| O. Harpacticoida          |                   | -                                      | -      | -      | -      | -      |
| <b>SEED SHRIMPS</b>       |                   |                                        |        |        |        |        |
| Cl. Ostracoda             |                   | 26                                     | 26     | 17     | 69     | 78     |
| <b><u>INSECTS</u></b>     |                   |                                        |        |        |        |        |
| Cl. Insecta               |                   |                                        |        |        |        |        |
| <b>CADDISFLIES</b>        |                   |                                        |        |        |        |        |
| O. Trichoptera            |                   |                                        |        |        |        |        |
| F. Apataniidae            |                   |                                        |        |        |        |        |
| <i>Apatania</i>           |                   | -                                      | -      | -      | -      | -      |
| F. Limnephilidae          |                   |                                        |        |        |        |        |
| <i>Grensia praeterita</i> |                   | -                                      | -      | -      | -      | -      |
| <b><u>TRUE FLIES</u></b>  |                   |                                        |        |        |        |        |
| O. Diptera                |                   |                                        |        |        |        |        |
| <b>MIDGES</b>             |                   |                                        |        |        |        |        |
| F. Chironomidae           |                   |                                        |        |        |        |        |
| chironomid pupae          |                   | 9                                      | -      | 17     | -      | 17     |
| S.F. Chironominae         |                   |                                        |        |        |        |        |
| <i>Chironomus</i>         |                   | -                                      | -      | -      | -      | -      |
| <i>Micropsectra</i>       |                   | 26                                     | 147    | 233    | 259    | 86     |

**Table F.19: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Reference Lake 3, August 2020**

| Taxa                                               | Study Area        | Reference Lake 03 - Profundal Stations |        |        |        |        |
|----------------------------------------------------|-------------------|----------------------------------------|--------|--------|--------|--------|
|                                                    | Replicate Station | REF-06                                 | REF-07 | REF-08 | REF-09 | REF-10 |
| <i>Paratanytarsus</i>                              |                   | -                                      | -      | -      | -      | -      |
| <i>Sergentia</i>                                   |                   | -                                      | -      | -      | -      | -      |
| <i>Stictochironomus</i>                            |                   | -                                      | -      | -      | -      | 17     |
| <i>Tanytarsus</i>                                  |                   | -                                      | -      | -      | -      | -      |
| <b>S.F. Diamesinae</b>                             |                   |                                        |        |        |        |        |
| <i>Diamesa</i>                                     |                   | -                                      | -      | -      | -      | -      |
| <i>Protanypus</i>                                  |                   | -                                      | -      | -      | -      | 9      |
| <i>Pseudodiamesa</i>                               |                   | -                                      | 9      | -      | -      | -      |
| <b>S.F. Orthoclaadiinae</b>                        |                   |                                        |        |        |        |        |
| <i>Abiskomyia</i>                                  |                   | 34                                     | -      | 9      | -      | 9      |
| <i>Heterotrissocladius</i>                         |                   | 198                                    | 164    | 181    | 310    | 284    |
| <i>Hydrobaenus</i>                                 |                   | -                                      | -      | -      | -      | -      |
| <i>Mesocricotopus</i>                              |                   | -                                      | -      | -      | -      | -      |
| <i>Paracladius</i>                                 |                   | -                                      | -      | -      | -      | -      |
| <i>Parakiefferiella</i>                            |                   | -                                      | -      | -      | -      | -      |
| <i>Psectrocladius</i>                              |                   | -                                      | -      | -      | -      | -      |
| <i>Zalutschia</i>                                  |                   | 17                                     | -      | -      | 17     | 17     |
| Orthoclaadiinae indeterminate                      |                   | -                                      | -      | -      | -      | -      |
| <b>S.F. Tanypodinae</b>                            |                   |                                        |        |        |        |        |
| <i>Arctopelopia</i>                                |                   | -                                      | -      | -      | -      | -      |
| <i>Procladius</i>                                  |                   | 9                                      | 9      | 9      | -      | -      |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                   | 338                                    | 355    | 493    | 684    | 537    |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                   | 8                                      | 5      | 8      | 5      | 9      |
| <b>Simpson's Evenness (E)</b>                      |                   | 0.689                                  | 0.758  | 0.694  | 0.795  | 0.721  |
| <b>Shannon-Wiener Diversity</b>                    |                   | 1.988                                  | 1.578  | 1.721  | 1.695  | 2.027  |
| <b>Dominant Taxonomic Group Compos</b>             |                   |                                        |        |        |        |        |
| % Nemata                                           |                   | 0.0                                    | 0.0    | 1.8    | 0.0    | 1.6    |
| % Hydracarina                                      |                   | 5.1                                    | 0.0    | 3.5    | 3.8    | 1.6    |
| % Ostracods                                        |                   | 7.7                                    | 7.3    | 3.5    | 10.1   | 14.5   |
| % Chironomids                                      |                   | 87.2                                   | 92.7   | 91.2   | 86.1   | 82.3   |
| % Metal Sensitive Chironmids                       |                   | 7.9                                    | 43.9   | 49.3   | 38.0   | 18.5   |
| <b>Functional Feeding Group Compositi</b>          |                   |                                        |        |        |        |        |
| % Collector - Gatherers                            |                   | 79.0                                   | 56.1   | 45.4   | 55.7   | 78.2   |
| % Filterers                                        |                   | 7.9                                    | 41.5   | 49.3   | 38.0   | 16.8   |
| % Shredders                                        |                   | 5.3                                    | 0.0    | 0.0    | 2.5    | 3.4    |
| <b>Habitat Preference Group Compositio</b>         |                   |                                        |        |        |        |        |
| % Clingers                                         |                   | 13.1                                   | 41.5   | 52.8   | 41.8   | 18.4   |
| % Sprawlers                                        |                   | 86.9                                   | 58.5   | 45.5   | 58.2   | 75.0   |
| % Burrowers                                        |                   | 0.0                                    | 0.0    | 1.8    | 0.0    | 6.6    |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.20: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2020**

| Taxa                      | Study Area<br>Replicate Station | Camp Lake - Littoral Stations |        |        |        |        |
|---------------------------|---------------------------------|-------------------------------|--------|--------|--------|--------|
|                           |                                 | JLO-02                        | JLO-21 | JLO-20 | JLO-19 | JLO-18 |
| <b>ROUNDWORMS</b>         |                                 |                               |        |        |        |        |
| P. Nemata                 |                                 | 34                            | 293    | 129    | 86     | 34     |
| <b><u>ANNELIDS</u></b>    |                                 |                               |        |        |        |        |
| P. Annelida               |                                 |                               |        |        |        |        |
| <b>WORMS</b>              |                                 |                               |        |        |        |        |
| Cl. Oligochaeta           |                                 |                               |        |        |        |        |
| F. Enchytraeidae          |                                 | -                             | -      | -      | -      | -      |
| F. Lumbriculidae          |                                 |                               |        |        |        |        |
| <i>Lumbriculus</i>        |                                 | 17                            | 17     | -      | 9      | 17     |
| <b><u>ARTHROPODS</u></b>  |                                 |                               |        |        |        |        |
| P. Arthropoda             |                                 |                               |        |        |        |        |
| <b>MITES</b>              |                                 |                               |        |        |        |        |
| Cl. Arachnida             |                                 |                               |        |        |        |        |
| O. Acarina                |                                 |                               |        |        |        |        |
| immature                  |                                 | -                             | -      | -      | -      | -      |
| F. Acalyptonotidae        |                                 |                               |        |        |        |        |
| <i>Acalyptonotus</i>      |                                 | 17                            | -      | 26     | 103    | 17     |
| F. Hygrobatidae           |                                 |                               |        |        |        |        |
| <i>Hygrobates</i>         |                                 | -                             | 34     | 9      | 9      | 103    |
| F. Lebertiidae            |                                 |                               |        |        |        |        |
| <i>Lebertia</i>           |                                 | -                             | 17     | 9      | 9      | -      |
| F. Sperchontidae          |                                 |                               |        |        |        |        |
| <i>Sperchon</i>           |                                 | -                             | -      | -      | -      | -      |
| <b>HARPACTICIDS</b>       |                                 |                               |        |        |        |        |
| O. Harpacticoida          |                                 | -                             | -      | -      | -      | -      |
| <b>SEED SHRIMPS</b>       |                                 |                               |        |        |        |        |
| Cl. Ostracoda             |                                 | 121                           | 328    | 129    | 52     | -      |
| <b><u>INSECTS</u></b>     |                                 |                               |        |        |        |        |
| Cl. Insecta               |                                 |                               |        |        |        |        |
| <b>CADDISFLIES</b>        |                                 |                               |        |        |        |        |
| O. Trichoptera            |                                 |                               |        |        |        |        |
| F. Apataniidae            |                                 |                               |        |        |        |        |
| <i>Apatania</i>           |                                 | 52                            | 52     | 9      | 69     | -      |
| F. Limnephilidae          |                                 |                               |        |        |        |        |
| <i>Grensia praeterita</i> |                                 | -                             | -      | -      | -      | -      |
| <b><u>TRUE FLIES</u></b>  |                                 |                               |        |        |        |        |
| O. Diptera                |                                 |                               |        |        |        |        |
| <b>MIDGES</b>             |                                 |                               |        |        |        |        |
| F. Chironomidae           |                                 |                               |        |        |        |        |
| chironomid pupae          |                                 | 52                            | 17     | 17     | 103    | 34     |
| S.F. Chironominae         |                                 |                               |        |        |        |        |
| <i>Chironomus</i>         |                                 | -                             | -      | -      | -      | 17     |
| <i>Micropsectra</i>       |                                 | 52                            | 379    | 267    | 1,259  | 86     |

**Table F.20: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Camp Lake - Littoral Stations |        |        |        |        |
|----------------------------------------------------|---------------------------------|-------------------------------|--------|--------|--------|--------|
|                                                    |                                 | JLO-02                        | JLO-21 | JLO-20 | JLO-19 | JLO-18 |
| <i>Paratanytarsus</i>                              |                                 | 517                           | 759    | 86     | 190    | 17     |
| <i>Sergentia</i>                                   |                                 | 17                            | -      | -      | -      | 121    |
| <i>Stictochironomus</i>                            |                                 | 1,672                         | 2,190  | 1,388  | 1,043  | 966    |
| <i>Tanytarsus</i>                                  |                                 | 121                           | 1,569  | 1,353  | 1,569  | 34     |
| <b>S.F. Diamesinae</b>                             |                                 |                               |        |        |        |        |
| <i>Diamesa</i>                                     |                                 | -                             | -      | -      | -      | -      |
| <i>Protanypus</i>                                  |                                 | -                             | -      | -      | 34     | 52     |
| <i>Pseudodiamesa</i>                               |                                 | -                             | -      | -      | -      | -      |
| <b>S.F. Orthoclaadiinae</b>                        |                                 |                               |        |        |        |        |
| <i>Abiskomyia</i>                                  |                                 | 241                           | 103    | 103    | 112    | 121    |
| <i>Heterotrissocladius</i>                         |                                 | 1,276                         | 1,431  | 440    | 457    | 259    |
| <i>Hydrobaenus</i>                                 |                                 | -                             | -      | -      | -      | -      |
| <i>Mesocricotopus</i>                              |                                 | -                             | -      | -      | -      | 17     |
| <i>Paracladius</i>                                 |                                 | -                             | 17     | 17     | -      | -      |
| <i>Parakiefferiella</i>                            |                                 | -                             | 34     | 52     | -      | 34     |
| <i>Psectrocladius</i>                              |                                 | -                             | -      | 17     | 34     | -      |
| <i>Zalutschia</i>                                  |                                 | -                             | 17     | 34     | 86     | -      |
| Orthoclaadiinae indeterminate                      |                                 | -                             | -      | -      | -      | -      |
| <b>S.F. Tanypodinae</b>                            |                                 |                               |        |        |        |        |
| <i>Arctopelopia</i>                                |                                 | 1,207                         | 414    | 207    | 147    | -      |
| <i>Procladius</i>                                  |                                 | 328                           | 379    | 69     | 103    | 69     |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 5,724                         | 8,052  | 4,362  | 5,474  | 2,000  |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 14                            | 17     | 18     | 18     | 16     |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.864                         | 0.889  | 0.827  | 0.858  | 0.773  |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.705                         | 3.006  | 2.770  | 2.889  | 2.715  |
| <b>Dominant Taxonomic Group Composition</b>        |                                 |                               |        |        |        |        |
| % Nemata                                           |                                 | 0.6                           | 3.6    | 3.0    | 1.6    | 1.7    |
| % Hydracarina                                      |                                 | 0.3                           | 0.6    | 1.0    | 2.2    | 6.0    |
| % Ostracods                                        |                                 | 2.1                           | 4.1    | 3.0    | 0.9    | 0.0    |
| % Chironomids                                      |                                 | 95.8                          | 90.8   | 92.9   | 93.9   | 91.4   |
| % Metal Sensitive Chironmids                       |                                 | 12.2                          | 33.7   | 39.3   | 56.9   | 9.7    |
| <b>Functional Feeding Group Composition</b>        |                                 |                               |        |        |        |        |
| % Collector - Gatherers                            |                                 | 59.6                          | 54.9   | 52.4   | 34.0   | 83.4   |
| % Filterers                                        |                                 | 12.2                          | 33.7   | 39.3   | 56.3   | 7.0    |
| % Shredders                                        |                                 | 0.0                           | 0.2    | 0.8    | 1.6    | 0.0    |
| <b>Habitat Preference Group Composition</b>        |                                 |                               |        |        |        |        |
| % Clingers                                         |                                 | 4.5                           | 25.5   | 38.5   | 56.2   | 18.3   |
| % Sprawlers                                        |                                 | 65.1                          | 43.3   | 26.6   | 22.0   | 26.4   |
| % Burrowers                                        |                                 | 30.4                          | 31.1   | 34.9   | 21.8   | 55.3   |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.20: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2020**

| Taxa                      | Study Area        | Camp Lake - Profundal Stations |        |        |        |        |
|---------------------------|-------------------|--------------------------------|--------|--------|--------|--------|
|                           | Replicate Station | JLO-16                         | JLO-01 | JLO-07 | JLO-11 | JLO-12 |
| <hr/>                     |                   |                                |        |        |        |        |
| <b>ROUNDWORMS</b>         |                   |                                |        |        |        |        |
| P. Nemata                 |                   | 34                             | 9      | -      | -      | 121    |
| <b><u>ANNELIDS</u></b>    |                   |                                |        |        |        |        |
| <b>P. Annelida</b>        |                   |                                |        |        |        |        |
| <b>WORMS</b>              |                   |                                |        |        |        |        |
| Cl. Oligochaeta           |                   |                                |        |        |        |        |
| <b>F. Enchytraeidae</b>   |                   | -                              | -      | -      | -      | -      |
| <b>F. Lumbriculidae</b>   |                   |                                |        |        |        |        |
| <i>Lumbriculus</i>        |                   | -                              | -      | -      | -      | -      |
| <b><u>ARTHROPODS</u></b>  |                   |                                |        |        |        |        |
| <b>P. Arthropoda</b>      |                   |                                |        |        |        |        |
| <b>MITES</b>              |                   |                                |        |        |        |        |
| Cl. Arachnida             |                   |                                |        |        |        |        |
| O. Acarina                |                   |                                |        |        |        |        |
| immature                  |                   | -                              | -      | -      | -      | -      |
| <b>F. Acalyptonotidae</b> |                   |                                |        |        |        |        |
| <i>Acalyptonotus</i>      |                   | 9                              | 9      | 9      | 17     | -      |
| <b>F. Hygrobatae</b>      |                   |                                |        |        |        |        |
| <i>Hygrobates</i>         |                   | 34                             | -      | -      | -      | -      |
| <b>F. Lebertiidae</b>     |                   |                                |        |        |        |        |
| <i>Lebertia</i>           |                   | 52                             | -      | -      | -      | -      |
| <b>F. Sperchontidae</b>   |                   |                                |        |        |        |        |
| <i>Sperchon</i>           |                   | -                              | -      | -      | -      | -      |
| <b>HARPACTICIDS</b>       |                   |                                |        |        |        |        |
| O. Harpacticoida          |                   | -                              | -      | -      | -      | -      |
| <b>SEED SHRIMPS</b>       |                   |                                |        |        |        |        |
| Cl. Ostracoda             |                   | 26                             | 43     | 17     | -      | 405    |
| <b><u>INSECTS</u></b>     |                   |                                |        |        |        |        |
| Cl. Insecta               |                   |                                |        |        |        |        |
| <b>CADDISFLIES</b>        |                   |                                |        |        |        |        |
| O. Trichoptera            |                   |                                |        |        |        |        |
| <b>F. Apataniidae</b>     |                   |                                |        |        |        |        |
| <i>Apatania</i>           |                   | -                              | -      | -      | -      | -      |
| <b>F. Limnephilidae</b>   |                   |                                |        |        |        |        |
| <i>Grensia praeterita</i> |                   | -                              | -      | -      | -      | -      |
| <b><u>TRUE FLIES</u></b>  |                   |                                |        |        |        |        |
| O. Diptera                |                   |                                |        |        |        |        |
| <b>MIDGES</b>             |                   |                                |        |        |        |        |
| <b>F. Chironomidae</b>    |                   |                                |        |        |        |        |
| chironomid pupae          |                   | 147                            | -      | 86     | 17     | 17     |
| <b>S.F. Chironominae</b>  |                   |                                |        |        |        |        |
| <i>Chironomus</i>         |                   | 43                             | -      | 586    | 776    | -      |
| <i>Micropsectra</i>       |                   | 26                             | 9      | -      | -      | 9      |

**Table F.20: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Camp Lake, August 2020**

| Taxa                                               | Study Area        | Camp Lake - Profundal Stations |        |        |        |        |
|----------------------------------------------------|-------------------|--------------------------------|--------|--------|--------|--------|
|                                                    | Replicate Station | JLO-16                         | JLO-01 | JLO-07 | JLO-11 | JLO-12 |
| <hr/>                                              |                   |                                |        |        |        |        |
| <i>Paratanytarsus</i>                              |                   | -                              | 17     | -      | 52     | -      |
| <i>Sergentia</i>                                   |                   | 78                             | -      | 86     | -      | -      |
| <i>Stictochironomus</i>                            |                   | 414                            | -      | 121    | 34     | -      |
| <i>Tanytarsus</i>                                  |                   | 198                            | -      | 95     | 155    | -      |
| <b>S.F. Diamesinae</b>                             |                   |                                |        |        |        |        |
| <i>Diamesa</i>                                     |                   | -                              | -      | -      | -      | -      |
| <i>Protanypus</i>                                  |                   | 34                             | 26     | 9      | -      | 34     |
| <i>Pseudodiamesa</i>                               |                   | 17                             | 17     | -      | -      | -      |
| <b>S.F. Orthoclaadiinae</b>                        |                   |                                |        |        |        |        |
| <i>Abiskomyia</i>                                  |                   | 155                            | 78     | 121    | 69     | 34     |
| <i>Heterotrissocladius</i>                         |                   | 302                            | 388    | -      | 17     | 1,672  |
| <i>Hydrobaenus</i>                                 |                   | -                              | -      | -      | -      | -      |
| <i>Mesocricotopus</i>                              |                   | -                              | -      | -      | -      | -      |
| <i>Paracladius</i>                                 |                   | 34                             | -      | -      | -      | 43     |
| <i>Parakiefferiella</i>                            |                   | 9                              | -      | -      | -      | -      |
| <i>Psectrocladius</i>                              |                   | -                              | -      | -      | -      | -      |
| <i>Zalutschia</i>                                  |                   | 17                             | -      | -      | -      | -      |
| Orthoclaadiinae indeterminate                      |                   | -                              | -      | -      | -      | -      |
| <b>S.F. Tanypodinae</b>                            |                   |                                |        |        |        |        |
| <i>Arctopelopia</i>                                |                   | -                              | 9      | -      | -      | 9      |
| <i>Procladius</i>                                  |                   | 52                             | 17     | -      | -      | -      |
| <hr/>                                              |                   |                                |        |        |        |        |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                   | 623                            | 1,134  | 1,688  | 1,143  | 2,355  |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                   | 11                             | 8      | 18     | 7      | 8      |
| <b>Simpson's Evenness (E)</b>                      |                   | 0.643                          | 0.732  | 0.901  | 0.576  | 0.512  |
| <b>Shannon-Wiener Diversity</b>                    |                   | 2.031                          | 2.003  | 3.278  | 1.553  | 1.346  |
| <b>Dominant Taxonomic Group Composition</b>        |                   |                                |        |        |        |        |
| % Nemata                                           |                   | 1.4                            | 0.0    | 2.1    | 0.0    | 5.1    |
| % Hydracarina                                      |                   | 1.4                            | 0.8    | 5.6    | 1.5    | 0.0    |
| % Ostracods                                        |                   | 6.9                            | 1.5    | 1.5    | 0.0    | 17.3   |
| % Chironomids                                      |                   | 90.3                           | 97.7   | 90.8   | 98.5   | 77.6   |
| % Metal Sensitive Chironomids                      |                   | 11.1                           | 9.9    | 18.2   | 18.5   | 1.9    |
| <b>Functional Feeding Group Composition</b>        |                   |                                |        |        |        |        |
| % Collector - Gatherers                            |                   | 90.3                           | 90.1   | 75.1   | 80.0   | 99.3   |
| % Filterers                                        |                   | 4.2                            | 9.1    | 14.8   | 18.5   | 0.4    |
| % Shredders                                        |                   | 0.0                            | 0.0    | 1.1    | 0.0    | 0.0    |
| <b>Habitat Preference Group Composition</b>        |                   |                                |        |        |        |        |
| % Clingers                                         |                   | 2.8                            | 18.2   | 25.5   | 15.4   | 0.4    |
| % Sprawlers                                        |                   | 91.7                           | 13.1   | 40.1   | 12.3   | 93.0   |
| % Burrowers                                        |                   | 5.6                            | 68.7   | 34.4   | 72.3   | 6.6    |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.21: Statistical Comparison of Bray-Curtis Index between the Mine-Exposed Lakes and Reference Lake 3, Mary River Project CREMP, August 2020**

| Waterbody                       | Comparison                                | n         |              | Betadisper<br>P-Value | Mantel Test |                |         | dbRDA   |                |                               |         |
|---------------------------------|-------------------------------------------|-----------|--------------|-----------------------|-------------|----------------|---------|---------|----------------|-------------------------------|---------|
|                                 |                                           | Reference | Mine-Exposed |                       | r           | R <sup>2</sup> | P-Value | F-Value | R <sup>2</sup> | R <sup>2</sup> <sub>adj</sub> | P-Value |
| Reference Lake 3                | Littoral vs Profundal                     | 5         | 5            | 0.277                 | 0.789       | 0.622          | 0.008   | 12.32   | 0.606          | 0.557                         | 0.006   |
| Camp Lake<br>(JL0)              | Littoral Habitat,<br>vs Reference Lake 3  | 5         | 5            | 0.855                 | 0.649       | 0.421          | 0.008   | 8.12    | 0.504          | 0.442                         | 0.008   |
|                                 | Profundal Habitat,<br>vs Reference Lake 3 | 5         | 5            | 0.011                 | 0.487       | 0.237          | 0.008   | 5.67    | 0.415          | 0.342                         | 0.008   |
| Sheardown Lake<br>NW<br>(DL0-1) | Littoral Habitat,<br>vs Reference Lake 3  | 5         | 5            | 0.229                 | 0.518       | 0.268          | 0.008   | 5.10    | 0.389          | 0.313                         | 0.013   |
|                                 | Profundal Habitat,<br>vs Reference Lake 3 | 5         | 5            | 0.554                 | 0.479       | 0.230          | 0.008   | 5.44    | 0.405          | 0.330                         | 0.008   |
| Sheardown Lake<br>SE<br>(DL0-2) | Littoral Habitat,<br>vs Reference Lake 3  | 5         | 5            | 0.350                 | 0.809       | 0.654          | 0.008   | 11.81   | 0.596          | 0.546                         | 0.008   |
|                                 | Profundal Habitat,<br>vs Reference Lake 3 | 5         | 5            | 0.590                 | 0.676       | 0.457          | 0.007   | 9.80    | 0.550          | 0.494                         | 0.008   |
| Mary Lake<br>(BL0)              | Littoral Habitat,<br>vs Reference Lake 3  | 5         | 4            | 0.044                 | 0.406       | 0.165          | 0.008   | 2.89    | 0.292          | 0.191                         | 0.021   |
|                                 | Profundal Habitat,<br>vs Reference Lake 3 | 5         | 6            | 0.243                 | 0.240       | 0.058          | 0.030   | 3.18    | 0.261          | 0.179                         | 0.010   |



Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.

**Table F.22: Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2013) for the Mary River Project CREMP**

| Metric                            | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                   | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2013 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> ) | ANOVA                         | log10               | YES                                 | <0.031  | 2013                                         | 4               | 7,752 | 3,849              | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 3,671 | 1,891              | -1.1                               | a,b                 |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 2,639 | 668                | -1.3                               | b                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 3,642 | 1,449              | -1.1                               | a,b                 |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 2,600 | 998                | -1.3                               | b                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 5,126 | 1,390              | -0.7                               | a,b                 |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 5,122 | 2,202              | -0.7                               | a,b                 |
| Richness (No. of Taxa)            | ANOVA                         | none                | NO                                  | 0.149   | 2013                                         | 4               | 18.0  | 4.4                | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 12.8  | 3.7                | -1.2                               | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 15.8  | 3.3                | -0.5                               | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 12.8  | 2.3                | -1.2                               | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 14.2  | 3.4                | -0.9                               | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 15.6  | 3.0                | -0.5                               | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 16.6  | 1.7                | -0.3                               | a                   |
| Simpson's Evenness                | ANOVA                         | none                | YES                                 | <0.001  | 2013                                         | 4               | 0.893 | 0.054              | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.712 | 0.063              | -3.4                               | b                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 0.917 | 0.034              | 0.4                                | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 0.848 | 0.068              | -0.8                               | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 0.851 | 0.057              | -0.8                               | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 0.893 | 0.053              | 0.0                                | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 0.842 | 0.044              | -1.0                               | a                   |
| Nemata (% of community)           | ANOVA                         | log10(x+1)          | NO                                  | 0.818   | 2013                                         | 4               | 5.6%  | 3.6%               | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 4.7%  | 4.6%               | -0.2                               | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 4.4%  | 4.8%               | -0.3                               | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 4.2%  | 4.2%               | -0.4                               | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 2.8%  | 3.2%               | -0.8                               | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 3.7%  | 2.5%               | -0.5                               | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 4.1%  | 3.9%               | -0.4                               | a                   |
| Ostracoda (% of community)        | ANOVA                         | log10(x+1)          | YES                                 | 0.007   | 2013                                         | 4               | 0.7%  | 0.5%               | -                                  | a,b,c               |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.2%  | 0.3%               | -1.0                               | b                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 1.8%  | 1.1%               | 2.5                                | a,c                 |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 0.2%  | 0.3%               | -1.1                               | b                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 0.4%  | 0.6%               | -0.7                               | b,c                 |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 1.3%  | 0.8%               | 1.3                                | a,b,c               |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 2.0%  | 1.6%               | 2.9                                | a                   |
| Chironomidae (% of community)     | ANOVA                         | none                | NO                                  | 0.270   | 2013                                         | 4               | 90.1% | 4.4%               | -                                  | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 93.1% | 4.7%               | 0.7                                | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 87.4% | 7.0%               | -0.6                               | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 92.2% | 6.5%               | 0.5                                | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 95.4% | 4.0%               | 1.2                                | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 92.6% | 3.6%               | 0.6                                | a                   |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 92.9% | 2.0%               | 0.6                                | a                   |



**Table F.22: Statistical Comparison of Benthic Invertebrate Community Metrics at Camp Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2013) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2013 | Pairwise Comparison |
| Metal Sensitive Taxa (% of community)   | ANOVA                         | none                | NO                                  | 0.588   | 2013                                         | 4               | 30.8% | 14.6%              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 38.5% | 24.5%              | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 29.7% | 11.8%              | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 38.2% | 17.3%              | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 17.4% | 18.5%              | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 34.6% | 16.1%              | 0.3                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 30.3% | 19.7%              | 0.0                                | a                   |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | NO                                  | 0.451   | 2013                                         | 4               | 55.9% | 12.4%              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 51.1% | 14.7%              | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 65.7% | 7.8%               | 0.8                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 50.8% | 17.4%              | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 67.3% | 18.6%              | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 53.7% | 12.4%              | -0.2                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 56.9% | 17.7%              | 0.1                                | a                   |
| Filterer FFG (% of community)           | ANOVA                         | none                | NO                                  | 0.520   | 2013                                         | 4               | 30.8% | 14.5%              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 38.2% | 24.3%              | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 25.0% | 7.5%               | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 37.3% | 17.3%              | 0.4                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 16.7% | 17.8%              | -1.0                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 31.8% | 15.9%              | 0.1                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 29.7% | 20.2%              | -0.1                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.23:** Statistical Comparison of Benthic Metrics at Camp Lake Profundal (Deep) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2013) for the Mary River Project CREMP

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2013 |                     |
| Density (No. per m <sup>2</sup> )       | ANOVA                         | none                | NO                                  | 0.251   | 2007                            | 4               | 2,627 | 1,403              | -                      | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 2,140 | 567                | -0.3                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 1,552 | 1,005              | -0.8                   | -1.0                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 1,510 | 844                | -0.8                   | -1.1                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 1,258 | 609                | -1.0                   | -1.6                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 1,847 | 830                | -0.6                   | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 1,383 | 656                | -0.9                   | -1.3                   | a                   |
| Richness (No. of Taxa)                  | ANOVA                         | log10               | YES                                 | 0.029   | 2007                            | 4               | 9.0   | 1.7                | -                      | -1.8                   | a,b                 |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 14.2  | 2.9                | 3.0                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 8.2   | 2.8                | -0.5                   | -2.0                   | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 10.8  | 3.3                | 1.0                    | -1.2                   | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 8.2   | 0.8                | -0.5                   | -2.0                   | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 11.0  | 1.9                | 1.2                    | -1.1                   | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 10.4  | 4.5                | 0.8                    | -1.3                   | a,b                 |
| Simpson's Evenness                      | ANOVA                         | none                | YES                                 | 0.089   | 2007                            | 4               | 0.602 | 0.114              | -                      | -1.0                   | a,b                 |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 0.720 | 0.122              | 1.0                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.604 | 0.283              | 0.0                    | -0.9                   | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.681 | 0.154              | 0.7                    | -0.3                   | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.374 | 0.118              | -2.0                   | -2.8                   | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.615 | 0.206              | 0.1                    | -0.9                   | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.673 | 0.151              | 0.6                    | -0.4                   | a,b                 |
| Nemata (% of community)                 | K-W                           | rank                | NO                                  | 0.780   | 2007                            | 4               | 3.5   | 3.1                | -                      | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 4.4   | 3.2                | 0.3                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 6.7   | 10.4               | 1.0                    | 0.7                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 7.1   | 6.2                | 1.2                    | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 2.9   | 5.6                | -0.2                   | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 4.4   | 5.7                | 0.3                    | 0.0                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 1.7   | 2.1                | -0.6                   | -0.8                   | a                   |
| Ostracoda (% of community)              | K-W                           | rank                | NO                                  | 0.200   | 2007                            | 4               | 0.0   | 0.1                | -                      | -0.8                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 0.4   | 0.4                | 4.9                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.3   | 0.7                | 3.6                    | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.3   | 0.6                | 3.3                    | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.7   | 1.5                | 8.6                    | 0.6                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 1.9   | 3.8                | 24.4                   | 3.3                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 5.5   | 7.1                | 72.4                   | 11.3                   | a                   |
| Chironomidae (% of community)           | K-W                           | rank                | NO                                  | 0.811   | 2007                            | 4               | 94.9  | 4.3                | -                      | 0.8                    | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 91.1  | 4.7                | -0.9                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 90.4  | 11.3               | -1.1                   | -0.1                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 90.0  | 6.6                | -1.1                   | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 95.2  | 7.9                | 0.1                    | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 91.4  | 7.1                | -0.8                   | 0.1                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 91.0  | 8.4                | -0.9                   | 0.0                    | a                   |
| Metal Sensitive Taxa (% of community)   | ANOVA                         | log10               | YES                                 | <0.001  | 2007                            | 4               | 34.8  | 4.8                | -                      | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 39.5  | 17.2               | 1.0                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 11.7  | 7.3                | -4.9                   | -1.6                   | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 33.3  | 25.5               | -0.3                   | -0.4                   | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 6.6   | 3.0                | -5.9                   | -1.9                   | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 19.5  | 10.5               | -3.2                   | -1.2                   | a,b,c               |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 11.9  | 6.9                | -4.8                   | -1.6                   | b,c                 |
| Collector-Gatherer FFG (% of community) | K-W                           | rank                | YES                                 | <0.001  | 2007                            | 4               | 64.6  | 6.1                | -                      | 0.4                    | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 57.0  | 19.9               | -1.3                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 84.7  | 7.3                | 3.3                    | 1.4                    | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 64.2  | 28.1               | -0.1                   | 0.4                    | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 95.6  | 2.9                | 5.1                    | 1.9                    | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 84.8  | 9.3                | 3.3                    | 1.4                    | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 87.0  | 9.5                | 3.7                    | 1.5                    | c                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | <0.001  | 2007                            | 4               | 32.6  | 4.0                | -                      | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 37.5  | 16.8               | 1.2                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 11.4  | 6.8                | -5.3                   | -1.6                   | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 31.6  | 26.4               | -0.2                   | -0.3                   | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 3.0   | 3.7                | -7.3                   | -2.1                   | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 12.0  | 8.3                | -5.1                   | -1.5                   | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 9.4   | 7.4                | -5.8                   | -1.7                   | c                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.24:** Replicate Grab Habitat Data for Benthic Invertebrate Community Samples Collected at the Sheardown Lake Tributaries, Mary River Project CREMP, August 2020

| Study Area                  | Station     | Water Depth (cm) |                  |                  | Water Velocity (m/s) |                  |                  | Embeddedness     |                  |                  | In-Stream Vegetation |                  |                  | Algae Presence   |                  |                  |
|-----------------------------|-------------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|
|                             |             | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 |
| Unnamed Reference Creek     | REF-CRK-B1  | 6                | 10               | 8                | 0.35                 | 0.50             | 0.33             | 25%              | 50%              | 25%              | sparse               | none             | none             | sparse           | sparse           | sparse           |
|                             | REF-CRK-B2  | 6                | 8                | 10               | 0.31                 | 0.37             | 0.48             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                             | REF-CRK-B3  | 16               | 8                | 7                | 0.33                 | 0.37             | 0.31             | 50%              | 50%              | 50%              | none                 | none             | none             | sparse           | sparse           | common           |
|                             | REF-CRK-B4  | 10               | 12               | 8                | 0.50                 | 0.51             | 0.42             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                             | REF-CRK-B5  | 10               | 8                | 9                | 0.37                 | 0.35             | 0.38             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
| Sheardown Lake Tributary 1  | SDLT1 - B1  | 8                | 12               | 13               | 0.30                 | 0.41             | 0.38             | 0%               | 50%              | 50%              | sparse               | sparse           | sparse           | common           | sparse           | sparse           |
|                             | SDLT1 - B2  | 8                | 10               | 11               | 0.32                 | 0.46             | 0.37             | 50%              | 50%              | 75%              | common               | sparse           | sparse           | sparse           | sparse           | sparse           |
|                             | SDLT1 - B3  | 7                | 10               | 12               | 0.31                 | 0.30             | 0.40             | 25%              | 25%              | 0%               | common               | common           | sparse           | sparse           | sparse           | sparse           |
|                             | SDLT1 - B4  | 10               | 8                | 8                | 0.44                 | 0.44             | 0.31             | 25%              | 25%              | 25%              | common               | common           | sparse           | sparse           | sparse           | sparse           |
|                             | SDLT1 - B5  | 4                | 5                | 7                | 0.30                 | 0.45             | 0.32             | 25%              | 50%              | 50%              | common               | common           | common           | sparse           | sparse           | sparse           |
| Sheardown Lake Tributary 9  | SDLT9 - B1  | 5                | 8                | 6                | 0.35                 | 0.38             | 0.30             | 50%              | 25%              | 25%              | sparse               | none             | none             | common           | sparse           | common           |
|                             | SDLT9 - B2  | 8                | 4                | 6                | 0.31                 | 0.30             | 0.31             | 25%              | 50%              | 25%              | sparse               | sparse           | sparse           | common           | common           | sparse           |
|                             | SDLT9 - B3  | 8                | 8                | 6                | 0.31                 | 0.35             | 0.30             | 50%              | 50%              | 25%              | none                 | none             | sparse           | sparse           | common           | common           |
|                             | SDLT9 - B4  | 5                | 6                | 8                | 0.32                 | 0.31             | 0.32             | 25%              | 50%              | 50%              | none                 | sparse           | sparse           | sparse           | common           | sparse           |
|                             | SDLT9 - B5  | 4                | 8                | 7                | 0.34                 | 0.41             | 0.32             | 50%              | 50%              | 50%              | sparse               | sparse           | sparse           | common           | common           | sparse           |
| Sheardown Lake Tributary 12 | SDLT12 - B1 | 14               | 16               | 9                | 0.05                 | 0.02             | 0.07             | 25%              | 0%               | 25%              | sparse               | none             | common           | sparse           | common           | common           |
|                             | SDLT12 - B2 | 4                | 8                | 8                | 0.02                 | 0.02             | 0.07             | 25%              | 25%              | 25%              | common               | sparse           | common           | common           | sparse           | sparse           |
|                             | SDLT12 - B3 | 4                | 4                | 5                | 0.08                 | 0.17             | 0.07             | 50%              | 25%              | 25%              | sparse               | sparse           | common           | common           | common           | common           |

**Table F.25: Replicate Station Habitat Feature Summary Statistics for the Sheardown Lake Tributary Benthic Stations, Mary River Project CREMP, August 2020**

| <b>Metric</b>                     | <b>Study Area</b>               | <b>Mean</b> | <b>Standard Deviation</b> | <b>Standard Error</b> | <b>Minimum</b> | <b>Median</b> | <b>Maximum</b> |
|-----------------------------------|---------------------------------|-------------|---------------------------|-----------------------|----------------|---------------|----------------|
| <b>Water Depth (cm)</b>           | Unnamed Reference Creek         | 9.1         | 1.1                       | 0.49                  | 8.0            | 9.0           | 10             |
|                                   | Sheardown Tributary 1 (SDLT1)   | 8.9         | 2.1                       | 1.0                   | 5.3            | 9.7           | 11             |
|                                   | Sheardown Tributary 12 (SDLT12) | 8.0         | 4.48                      | 2.59                  | 4.3            | 6.7           | 13.0           |
|                                   | Sheardown Tributary 9 (SDLT9)   | 6.5         | 0.5                       | 0.2                   | 6.0            | 6.3           | 7              |
| <b>Water Velocity (m/s)</b>       | Unnamed Reference Creek         | 0.39        | 0.052                     | 0.023                 | 0.34           | 0.39          | 0.48           |
|                                   | Sheardown Tributary 1 (SDLT1)   | 0.37        | 0.023                     | 0.010                 | 0.34           | 0.36          | 0.40           |
|                                   | Sheardown Tributary 12 (SDLT12) | 0.06        | 0.038                     | 0.0219                | 0.04           | 0.05          | 0.11           |
|                                   | Sheardown Tributary 9 (SDLT9)   | 0.33        | 0.02                      | 0.01                  | 0.31           | 0.32          | 0.36           |
| <b>Substrate Embeddedness (%)</b> | Unnamed Reference Creek         | 38%         | 10%                       | 4%                    | 25%            | 42%           | 50%            |
|                                   | Sheardown Tributary 1 (SDLT1)   | 35%         | 16%                       | 7%                    | 17%            | 33%           | 58%            |
|                                   | Sheardown Tributary 12 (SDLT12) | 25%         | 8%                        | 5%                    | 17%            | 25%           | 33%            |
|                                   | Sheardown Tributary 9 (SDLT9)   | 40%         | 7%                        | 3%                    | 33%            | 42%           | 50%            |

Note: Five stations were sampled at Unnamed Reference Creek, SDLT1, and SDLT9, and three stations were sampled at SDLT12.

**Table F.26: Benthic Station Habitat Feature Statistical Comparisons Between Individual Sheardown Lake Tributaries and Unnamed Reference Creek, Mary River Project CREMP, August 2020**

| Metric                     | Pair-wise comparisons <sup>a</sup> |        |                               |                     |                                       |         |
|----------------------------|------------------------------------|--------|-------------------------------|---------------------|---------------------------------------|---------|
|                            | Area 1                             | Area 2 | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference between Areas? | P-value |
| Water Depth (cm)           | Unnamed Reference Creek            | SDLT1  | tequal                        | none                | NO                                    | 0.857   |
|                            | Unnamed Reference Creek            | SDLT12 | tequal                        | none                | NO                                    | 0.613   |
|                            | Unnamed Reference Creek            | SDLT9  | tequal                        | none                | YES                                   | <0.001  |
| Water Velocity (m/s)       | Unnamed Reference Creek            | SDLT1  | tequal                        | none                | NO                                    | 0.363   |
|                            | Unnamed Reference Creek            | SDLT12 | tequal                        | none                | YES                                   | 0.001   |
|                            | Unnamed Reference Creek            | SDLT9  | tequal                        | none                | YES                                   | 0.036   |
| Substrate Embeddedness (%) | Unnamed Reference Creek            | SDLT1  | tequal                        | none                | NO                                    | 0.700   |
|                            | Unnamed Reference Creek            | SDLT12 | tequal                        | none                | YES                                   | 0.092   |
|                            | Unnamed Reference Creek            | SDLT9  | tequal                        | none                | NO                                    | 0.760   |

 Shaded values indicate significant difference between study areas based on statistical test p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table F.27: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 1, August 2020**

| Taxa                        | Study Area<br>Replicate Station | Sheardown Lake Tributary 1 (SDLT1) |     |    |    |    |
|-----------------------------|---------------------------------|------------------------------------|-----|----|----|----|
|                             |                                 | B1                                 | B2  | B3 | B4 | B5 |
| <b>ROUNDWORMS</b>           |                                 |                                    |     |    |    |    |
| <b>P. Nemata</b>            |                                 | 54                                 | 36  | 25 | 14 | 22 |
| <b>ANNELIDS</b>             |                                 |                                    |     |    |    |    |
| <b>P. Annelida</b>          |                                 |                                    |     |    |    |    |
| <b>WORMS</b>                |                                 |                                    |     |    |    |    |
| Cl. Oligochaeta             |                                 |                                    |     |    |    |    |
| <b>F. Enchytraeidae</b>     |                                 | 39                                 | 7   | 4  | -  | 18 |
| <b>F. Lumbriculidae</b>     |                                 |                                    |     |    |    |    |
| <i>Lumbriculus</i>          |                                 | -                                  | -   | -  | -  | -  |
| <b>ARTHROPODS</b>           |                                 |                                    |     |    |    |    |
| <b>P. Arthropoda</b>        |                                 |                                    |     |    |    |    |
| <b>MITES</b>                |                                 |                                    |     |    |    |    |
| Cl. Arachnida               |                                 |                                    |     |    |    |    |
| O. Acarina                  |                                 |                                    |     |    |    |    |
| immature                    |                                 | 4                                  | -   | -  | -  | -  |
| <b>F. Lebertiidae</b>       |                                 |                                    |     |    |    |    |
| <i>Lebertia</i>             |                                 | 4                                  | -   | -  | -  | -  |
| <b>F. Sperchonidae</b>      |                                 |                                    |     |    |    |    |
| <i>Sperchon</i>             |                                 | 22                                 | 4   | -  | 7  | 4  |
| <b>HARPACTICIDS</b>         |                                 |                                    |     |    |    |    |
| O. Harpacticoida            |                                 | -                                  | -   | -  | -  | -  |
| <b>SEED SHRIMPS</b>         |                                 |                                    |     |    |    |    |
| Cl. Ostracoda               |                                 | 4                                  | -   | -  | -  | -  |
| <b>SPRINGTAILS</b>          |                                 |                                    |     |    |    |    |
| Cl. Entognatha              |                                 |                                    |     |    |    |    |
| O. Collembola               |                                 | -                                  | -   | -  | 7  | -  |
| <b>INSECTS</b>              |                                 |                                    |     |    |    |    |
| Cl. Insecta                 |                                 |                                    |     |    |    |    |
| <b>MAYFLIES</b>             |                                 |                                    |     |    |    |    |
| O. Ephemeroptera            |                                 |                                    |     |    |    |    |
| <b>F. Baetidae</b>          |                                 |                                    |     |    |    |    |
| <i>Acentrella feropagus</i> |                                 | -                                  | -   | -  | -  | -  |
| <b>CADDISFLIES</b>          |                                 |                                    |     |    |    |    |
| O. Trichoptera              |                                 |                                    |     |    |    |    |
| <b>F. Apataniidae</b>       |                                 |                                    |     |    |    |    |
| <i>Apatania</i>             |                                 | 4                                  | -   | -  | -  | -  |
| <b>F. Limnephilidae</b>     |                                 |                                    |     |    |    |    |
| immature                    |                                 | -                                  | -   | -  | -  | -  |
| <b>TRUE FLIES</b>           |                                 |                                    |     |    |    |    |
| O. Diptera                  |                                 |                                    |     |    |    |    |
| <b>BITING-MIDGE</b>         |                                 |                                    |     |    |    |    |
| <b>F. Ceratopogonidae</b>   |                                 |                                    |     |    |    |    |
| <i>Culicoides</i>           |                                 | -                                  | -   | -  | -  | -  |
| <b>MIDGES</b>               |                                 |                                    |     |    |    |    |
| <b>F. Chironomidae</b>      |                                 |                                    |     |    |    |    |
| chironomid pupae            |                                 | 50                                 | 65  | 4  | 25 | 22 |
| <b>S.F. Chironominae</b>    |                                 |                                    |     |    |    |    |
| <i>Micropsectra</i>         |                                 | 7                                  | -   | 4  | -  | -  |
| <i>Paratanytarsus</i>       |                                 | -                                  | 4   | -  | -  | -  |
| <i>Rheotanytarsus</i>       |                                 | -                                  | -   | -  | 7  | -  |
| <i>Tanytarsus</i>           |                                 | 7                                  | -   | -  | -  | -  |
| <b>S.F. Diamesinae</b>      |                                 |                                    |     |    |    |    |
| <i>Diamesa</i>              |                                 | -                                  | -   | -  | -  | -  |
| <i>Pseudokiefferiella</i>   |                                 | 111                                | 36  | 22 | 22 | 47 |
| <b>S.F. Orthocladiinae</b>  |                                 |                                    |     |    |    |    |
| <i>Chaetocladius</i>        |                                 | -                                  | -   | -  | -  | -  |
| <i>Corynoneura</i>          |                                 | -                                  | -   | -  | -  | -  |
| <i>Cricotopus</i>           |                                 | 147                                | 100 | 14 | 50 | 14 |

**Table F.27: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 1, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Lake Tributary 1 (SDLT1) |       |       |       |       |
|----------------------------------------------------|---------------------------------|------------------------------------|-------|-------|-------|-------|
|                                                    |                                 | B1                                 | B2    | B3    | B4    | B5    |
| <i>Cricotopus/Orthocladius</i>                     |                                 | 54                                 | 29    | -     | 11    | -     |
| <i>Diplocladius</i>                                |                                 | -                                  | -     | -     | -     | 4     |
| <i>Doncricotopus</i>                               |                                 | 7                                  | -     | -     | -     | -     |
| <i>Eukiefferiella</i>                              |                                 | -                                  | -     | 4     | -     | -     |
| <i>Hydrobaenus</i>                                 |                                 | 7                                  | -     | -     | -     | -     |
| <i>Hydrosmitia</i>                                 |                                 | 1,086                              | 452   | 93    | 161   | 125   |
| <i>Krenosmitia</i>                                 |                                 | -                                  | -     | -     | -     | -     |
| <i>Limnophyes</i>                                  |                                 | -                                  | -     | -     | -     | -     |
| <i>Metriocnemus</i>                                |                                 | -                                  | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | -                                  | 7     | -     | -     | -     |
| <i>Parakiefferiella</i>                            |                                 | 32                                 | 7     | 4     | 4     | -     |
| <i>Paraphaenocladius</i>                           |                                 | -                                  | -     | -     | -     | -     |
| <i>Tokunagaia</i>                                  |                                 | -                                  | -     | 4     | -     | 4     |
| <i>Tvetenia</i>                                    |                                 | -                                  | 61    | 7     | 22    | 4     |
| indeterminate                                      |                                 | 25                                 | -     | 4     | -     | -     |
| <b>S.F. Podonominae</b>                            |                                 |                                    |       |       |       |       |
| <i>Trichotanytus</i>                               |                                 | -                                  | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                            |                                 |                                    |       |       |       |       |
| <i>Procladius</i>                                  |                                 | -                                  | -     | 4     | -     | -     |
| <i>Thienemannimyia</i> complex                     |                                 | 25                                 | 11    | -     | 4     | 4     |
| <b>F. Dixidae</b>                                  |                                 |                                    |       |       |       |       |
| pupae                                              |                                 | -                                  | -     | 4     | -     | -     |
| <b>F. Empididae</b>                                |                                 |                                    |       |       |       |       |
| <i>Clinocera</i>                                   |                                 | -                                  | -     | 7     | -     | -     |
| <b>F. Ephydriidae</b>                              |                                 | -                                  | -     | -     | -     | -     |
| <b>F. Muscidae</b>                                 |                                 | 4                                  | 4     | -     | -     | -     |
| <b>F. Simuliidae</b>                               |                                 |                                    |       |       |       |       |
| <i>Gymnopaia</i>                                   |                                 | -                                  | -     | -     | -     | -     |
| <i>Metacnephia</i>                                 |                                 | -                                  | -     | -     | -     | -     |
| <i>Prosimulium</i>                                 |                                 | -                                  | -     | -     | -     | -     |
| pupae                                              |                                 | -                                  | -     | -     | -     | -     |
| <b>F. Tipulidae</b>                                |                                 |                                    |       |       |       |       |
| <i>Dicranota</i>                                   |                                 | -                                  | -     | -     | -     | -     |
| <i>Ormosia</i>                                     |                                 | -                                  | -     | -     | -     | -     |
| <i>Tipula</i>                                      |                                 | 11                                 | 29    | 14    | 22    | 7     |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 1,703                              | 849   | 215   | 355   | 272   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 18                                 | 13    | 14    | 11    | 11    |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.575                              | 0.677 | 0.824 | 0.774 | 0.757 |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 1.955                              | 2.116 | 2.823 | 2.396 | 2.312 |
| <b>Dominant Group Composition</b>                  |                                 |                                    |       |       |       |       |
| % Nemata                                           |                                 | 3.2                                | 4.2   | 11.7  | 4.0   | 7.9   |
| % Oligochaeta                                      |                                 | 0.0                                | 0.0   | 0.0   | 0.0   | 0.0   |
| % Hydracarina                                      |                                 | 1.7                                | 0.4   | 0.0   | 2.0   | 1.3   |
| % Ostracods                                        |                                 | 0.2                                | 0.0   | 0.0   | 0.0   | 0.0   |
| % Ephemeroptera                                    |                                 | 0.0                                | 0.0   | 0.0   | 0.0   | 0.0   |
| % Chironomids                                      |                                 | 91.6                               | 90.7  | 75.0  | 85.9  | 81.6  |
| % Metal Sensitive Chironomids                      |                                 | 7.6                                | 5.1   | 11.9  | 8.8   | 18.9  |
| % Simuliidae                                       |                                 | 0.0                                | 0.0   | 0.0   | 0.0   | 0.0   |
| % Tipulidae                                        |                                 | 0.6                                | 3.4   | 6.7   | 6.1   | 2.6   |
| <b>Functional Feeding Group Composition</b>        |                                 |                                    |       |       |       |       |
| % Collector - Gatherers                            |                                 | 82.7                               | 77.6  | 78.1  | 69.9  | 88.8  |
| % Filterers                                        |                                 | 0.9                                | 0.5   | 3.4   | 2.2   | 0.0   |
| % Shredders                                        |                                 | 12.8                               | 19.7  | 13.5  | 24.8  | 8.5   |
| <b>Habitat Preference Group Composition</b>        |                                 |                                    |       |       |       |       |
| % Clingers                                         |                                 | 14.9                               | 16.8  | 13.5  | 22.9  | 7.1   |
| % Sprawlers                                        |                                 | 78.7                               | 74.4  | 66.5  | 64.9  | 75.8  |
| % Burrowers                                        |                                 | 6.3                                | 8.9   | 20.0  | 10.1  | 17.1  |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.28: Benthic Invertebrate Community Summary Statistics for the Sheardown Lake Tributaries, Mary River Project CREMP, August 2020**

| Metric                                           | Area                            | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|--------------------------------------------------|---------------------------------|-------|--------------------|----------------|---------|--------|---------|
| Density<br>(no. organisms/m <sup>2</sup> )       | Unnamed Reference Creek         | 713   | 296                | 133            | 258     | 821    | 1,032   |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 679   | 625                | 279            | 215     | 355    | 1,703   |
|                                                  | Sheardown Tributary 12 (SDLT12) | 1,318 | 26                 | 15             | 1,297   | 1,308  | 1,348   |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 1,601 | 841                | 376            | 892     | 1,111  | 2,556   |
| Richness<br>(Number of Taxa)                     | Unnamed Reference Creek         | 16.0  | 4.4                | 2.0            | 9.0     | 17.0   | 20.0    |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 13.4  | 2.9                | 1.3            | 11.0    | 13.0   | 18.0    |
|                                                  | Sheardown Tributary 12 (SDLT12) | 17.3  | 4.2                | 2.4            | 14.0    | 16.0   | 22.0    |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 18.0  | 4.7                | 2.1            | 14.0    | 16.0   | 24.0    |
| Simpson's Evenness                               | Unnamed Reference Creek         | 0.840 | 0.043              | 0.019          | 0.767   | 0.856  | 0.878   |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 0.722 | 0.097              | 0.044          | 0.575   | 0.757  | 0.824   |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.832 | 0.063              | 0.036          | 0.759   | 0.860  | 0.876   |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 0.855 | 0.024              | 0.011          | 0.831   | 0.841  | 0.884   |
| Nemata<br>(% of community)                       | Unnamed Reference Creek         | 0.7   | 1.3                | 0.6            | 0.0     | 0.3    | 3.0     |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 6.2   | 3.6                | 1.6            | 3.2     | 4.2    | 11.7    |
|                                                  | Sheardown Tributary 12 (SDLT12) | 5.4   | 1.7                | 1.0            | 3.6     | 5.8    | 6.9     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 3.1   | 2.3                | 1.0            | 0.6     | 2.6    | 6.4     |
| Oligochaeta<br>(% of community)                  | Unnamed Reference Creek         | 0.0   | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 0.0   | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.4   | 0.3                | 0.2            | 0.0     | 0.5    | 0.6     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 0.0   | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
| Hydracarina<br>(% of community)                  | Unnamed Reference Creek         | 4.5   | 3.7                | 1.7            | 2.1     | 3.0    | 11.1    |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 1.1   | 0.9                | 0.4            | 0.0     | 1.3    | 2.0     |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.2   | 0.2                | 0.1            | 0.0     | 0.3    | 0.3     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 4.2   | 1.8                | 0.8            | 2.2     | 3.4    | 6.8     |
| Ostracoda<br>(% of community)                    | Unnamed Reference Creek         | 30.6  | 11.7               | 5.3            | 16.7    | 34.2   | 42.0    |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 0.0   | 0.1                | 0.0            | 0.0     | 0.0    | 0.2     |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.6   | 0.1                | 0.1            | 0.5     | 0.6    | 0.8     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 8.2   | 2.6                | 1.1            | 4.9     | 9.0    | 11.0    |
| Chironomidae<br>(% of community)                 | Unnamed Reference Creek         | 48.3  | 12.9               | 5.8            | 36.7    | 43.1   | 67.3    |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 85.0  | 6.9                | 3.1            | 75.0    | 85.9   | 91.6    |
|                                                  | Sheardown Tributary 12 (SDLT12) | 88.6  | 2.1                | 1.2            | 87.0    | 87.8   | 91.0    |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 70.3  | 4.3                | 1.9            | 63.5    | 72.9   | 73.2    |
| Metal-Sensitive Chironomidae<br>(% of community) | Unnamed Reference Creek         | 0.8   | 1.2                | 0.6            | 0.0     | 0.5    | 3.0     |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 10.5  | 5.3                | 2.4            | 5.1     | 8.8    | 18.9    |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.5   | 0.4                | 0.2            | 0.0     | 0.6    | 0.8     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 3.2   | 3.6                | 1.6            | 0.0     | 2.1    | 9.1     |
| Simuliidae<br>(% of community)                   | Unnamed Reference Creek         | 9.8   | 8.6                | 3.8            | 0.0     | 8.7    | 20.7    |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 0.0   | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
|                                                  | Sheardown Tributary 12 (SDLT12) | 0.0   | 0.0                | 0.0            | 0.0     | 0.0    | 0.0     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 0.5   | 0.9                | 0.4            | 0.0     | 0.0    | 2.1     |
| Tipulidae<br>(% of community)                    | Unnamed Reference Creek         | 1.5   | 2.3                | 1.0            | 0.0     | 0.9    | 5.6     |
|                                                  | Sheardown Tributary 1 (SDLT1)   | 3.9   | 2.5                | 1.1            | 0.6     | 3.4    | 6.7     |
|                                                  | Sheardown Tributary 12 (SDLT12) | 1.5   | 0.7                | 0.4            | 1.1     | 1.1    | 2.2     |
|                                                  | Sheardown Tributary 9 (SDLT9)   | 3.1   | 1.3                | 0.6            | 2.0     | 2.5    | 5.2     |



**Table F.28: Benthic Invertebrate Community Summary Statistics for the Sheardown Lake Tributaries, Mary River Project CREMP, August 2020**

| Metric                                            | Area                            | Mean | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|---------------------------------------------------|---------------------------------|------|--------------------|----------------|---------|--------|---------|
| <b>Collector-Gatherer FFG</b><br>(% of community) | Unnamed Reference Creek         | 80.7 | 8.8                | 3.9            | 70.0    | 77.6   | 91.1    |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 79.4 | 7.0                | 3.1            | 69.9    | 78.1   | 88.8    |
|                                                   | Sheardown Tributary 12 (SDLT12) | 82.2 | 1.4                | 0.8            | 80.7    | 82.2   | 83.6    |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 63.1 | 6.9                | 3.1            | 56.5    | 63.0   | 72.8    |
| <b>Filterer FFG</b><br>(% of community)           | Unnamed Reference Creek         | 9.9  | 8.9                | 4.0            | 0.0     | 8.0    | 21.5    |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 1.4  | 1.4                | 0.6            | 0.0     | 0.9    | 3.4     |
|                                                   | Sheardown Tributary 12 (SDLT12) | 0.2  | 0.3                | 0.2            | 0.0     | 0.0    | 0.5     |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 0.5  | 0.8                | 0.4            | 0.0     | 0.0    | 1.8     |
| <b>Shredder FFG</b><br>(% of community)           | Unnamed Reference Creek         | 2.8  | 2.7                | 1.2            | 0.0     | 2.4    | 7.0     |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 15.8 | 6.4                | 2.9            | 8.5     | 13.5   | 24.8    |
|                                                   | Sheardown Tributary 12 (SDLT12) | 16.9 | 1.8                | 1.0            | 15.7    | 16.2   | 19.0    |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 29.8 | 6.8                | 3.0            | 22.4    | 26.7   | 38.3    |
| <b>Clinger HPG</b><br>(% of community)            | Unnamed Reference Creek         | 15.8 | 7.7                | 3.5            | 7.8     | 12.6   | 27.0    |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 15.1 | 5.7                | 2.6            | 7.1     | 14.9   | 22.9    |
|                                                   | Sheardown Tributary 12 (SDLT12) | 16.3 | 1.9                | 1.1            | 14.5    | 16.2   | 18.2    |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 33.4 | 8.1                | 3.6            | 22.0    | 32.5   | 41.2    |
| <b>Sprawler HPG</b><br>(% of community)           | Unnamed Reference Creek         | 79.4 | 6.6                | 3.0            | 70.0    | 79.1   | 87.2    |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 72.1 | 6.0                | 2.7            | 64.9    | 74.4   | 78.7    |
|                                                   | Sheardown Tributary 12 (SDLT12) | 73.8 | 0.3                | 0.2            | 73.6    | 73.7   | 74.2    |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 53.0 | 9.9                | 4.4            | 37.6    | 57.2   | 63.1    |
| <b>Burrower HPG</b><br>(% of community)           | Unnamed Reference Creek         | 4.8  | 3.3                | 1.5            | 1.4     | 3.1    | 8.3     |
|                                                   | Sheardown Tributary 1 (SDLT1)   | 12.5 | 5.8                | 2.6            | 6.3     | 10.1   | 20.0    |
|                                                   | Sheardown Tributary 12 (SDLT12) | 9.9  | 1.6                | 0.9            | 8.2     | 10.1   | 11.3    |
|                                                   | Sheardown Tributary 9 (SDLT9)   | 8.1  | 2.8                | 1.3            | 4.9     | 10.0   | 10.5    |

Note: Sample size equals five for Unnamed Reference Creek, SDLT1, and SDLT9, and three for SDLT12.

**Table F.29: Statistical Comparison of Bray-Curtis Index for the Sheardown Lake Tributaries Compared to Unnamed Reference Creek, Mary River Project CREMP, August 2020**

| Comparison                | Betadisper<br>P-Value | Mantel Test |                |         | dbRDA   |                |                               |         |
|---------------------------|-----------------------|-------------|----------------|---------|---------|----------------|-------------------------------|---------|
|                           |                       | r           | R <sup>2</sup> | P-Value | F-Value | R <sup>2</sup> | R <sup>2</sup> <sub>adj</sub> | P-Value |
| SDLT1 vs Reference Creek  | 0.661                 | 0.822       | 0.676          | 0.008   | 11.17   | 0.583          | 0.530                         | 0.006   |
| SDLT12 vs Reference Creek | 0.435                 | 0.835       | 0.697          | 0.008   | 10.34   | 0.564          | 0.509                         | 0.007   |
| SDLT9 vs Reference Creek  | 0.846                 | 0.570       | 0.324          | 0.008   | 5.31    | 0.399          | 0.324                         | 0.007   |

 Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.

Note: Sample size was five for all study areas except SDLT9, at which the sample size was three.

**Table F.30:** Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 1 (SDLT1) Among Years of Mine Operation (2015 to 2020) and Baseline (2008, 2013) for the Mary River Project CREMP

| Metric                                | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2008 | vs. Baseline Year 2013 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10               | YES                                 | 0.003   | 2008                            | 3               | 300   | 52                 | -                      | -2.0                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 657   | 176                | 6.8                    | -                      | a,b,c               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 722   | 485                | 8.1                    | 0.4                    | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 2,453 | 814                | 41.1                   | 10.2                   | c                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 1,660 | 1,643              | 26.0                   | 5.7                    | a,b,c               |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1,102 | 766                | 15.3                   | 2.5                    | a,b,c               |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1,483 | 982                | 22.6                   | 4.7                    | b,c                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 679   | 625                | 7.2                    | 0.1                    | a,c                 |
| Richness (No. of Taxa)                | ANOVA                         | none                | NO                                  | 0.305   | 2008                            | 3               | 12.0  | 1.0                | -                      | -1.9                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 16.7  | 2.5                | 4.7                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 15.4  | 4.3                | 3.4                    | -0.5                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 15.2  | 2.5                | 3.2                    | -0.6                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 14.0  | 2.0                | 2.0                    | -1.1                   | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 12.8  | 1.6                | 0.8                    | -1.5                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 14.8  | 1.9                | 2.8                    | -0.8                   | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 13.4  | 2.9                | 1.4                    | -1.3                   | a                   |
| Simpson's Evenness                    | ANOVA                         | none                | YES                                 | <0.001  | 2008                            | 3               | 0.894 | 0.034              | -                      | 0.1                    | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 0.887 | 0.064              | -0.2                   | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.869 | 0.067              | -0.7                   | -0.3                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.872 | 0.032              | -0.7                   | -0.2                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.883 | 0.028              | -0.3                   | -0.1                   | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.834 | 0.063              | -1.8                   | -0.8                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.787 | 0.026              | -3.2                   | -1.6                   | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.722 | 0.097              | -5.1                   | -2.6                   | b                   |
| Oligochaeta (% of community)          | K-W                           | rank                | YES                                 | 0.005   | 2008                            | 3               | 3.0   | 2.5                | -                      | -1.3                   | a,c,d               |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 7.3   | 3.3                | 1.8                    | -                      | a,b,c               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 14.4  | 10.8               | 4.6                    | 2.1                    | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 14.1  | 8.8                | 4.5                    | 2.0                    | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 8.6   | 7.4                | 2.3                    | 0.4                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 2.2   | 2.8                | -0.3                   | -1.5                   | c,d                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 3.3   | 1.0                | 0.1                    | -1.2                   | a,b,c               |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.0   | 0.0                | -1.2                   | -2.2                   | d                   |
| Hydracarina (% of community)          | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2008                            | 3               | 12.1  | 4.7                | -                      | 2.6                    | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 4.6   | 2.9                | -1.6                   | -                      | b,c                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 4.6   | 1.6                | -1.6                   | 0.0                    | b,c                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 5.3   | 1.3                | -1.4                   | 0.2                    | b                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 3.9   | 2.0                | -1.7                   | -0.2                   | b,c                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 3.1   | 1.7                | -1.9                   | -0.5                   | b,c                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1.3   | 0.9                | -2.3                   | -1.1                   | c                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 1.1   | 0.9                | -2.3                   | -1.2                   | c                   |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | <0.001  | 2008                            | 3               | 69.2  | 2.0                | -                      | -3.0                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 81.1  | 3.9                | 6.0                    | -                      | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 72.0  | 9.0                | 1.4                    | -2.3                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 73.1  | 11.9               | 2.0                    | -2.0                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 82.4  | 10.1               | 6.7                    | 0.3                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 90.7  | 4.4                | 10.9                   | 2.5                    | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 91.6  | 1.6                | 11.4                   | 2.7                    | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 85.0  | 6.9                | 8.0                    | 1.0                    | a,b                 |
| Metal Sensitive Taxa (% of community) | ANOVA                         | log10               | YES                                 | <0.001  | 2008                            | 3               | 27.5  | 5.5                | -                      | 0.5                    | a,b                 |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 19.9  | 14.3               | -1.4                   | -                      | a,b,c               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 6.1   | 2.9                | -3.9                   | -1.0                   | c                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 15.6  | 4.4                | -2.2                   | -0.3                   | a,b,c               |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 26.1  | 15.6               | -0.3                   | 0.4                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 19.8  | 12.4               | -1.4                   | 0.0                    | a,b                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 31.2  | 11.0               | 0.7                    | 0.8                    | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 10.5  | 5.3                | -3.1                   | -0.7                   | b,c                 |
| Tipulidae (% of community)            | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2008                            | 3               | 14.7  | 2.7                | -                      | 22.9                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 3.8   | 0.5                | -4.0                   | -                      | b                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.1   | 1.3                | -4.7                   | -3.7                   | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 3.5   | 1.9                | -4.1                   | -0.6                   | b                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 2.8   | 2.7                | -4.4                   | -2.1                   | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1.9   | 1.3                | -4.7                   | -4.0                   | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2.1   | 1.6                | -4.6                   | -3.6                   | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 3.9   | 2.5                | -4.0                   | 0.1                    | b                   |

**Table F.30: Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 1 (SDLT1) Among Years of Mine Operation (2015 to 2020) and Baseline (2008, 2013) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2008 | vs. Baseline Year 2013 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | <0.001  | 2008                            | 3               | 40.3 | 2.9                | -                      | -2.0                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 55.5 | 7.5                | 5.2                    | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 64.2 | 5.2                | 8.2                    | 1.2                    | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 58.6 | 10.7               | 6.3                    | 0.4                    | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 55.3 | 8.0                | 5.2                    | 0.0                    | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 62.2 | 9.3                | 7.5                    | 0.9                    | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 81.6 | 4.9                | 14.2                   | 3.5                    | c                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 79.4 | 7.0                | 13.4                   | 3.2                    | c                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.002   | 2008                            | 3               | 5.2  | 3.5                | -                      | -2.0                   | a,b                 |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 8.5  | 1.6                | 0.9                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 4.5  | 1.4                | -0.2                   | -2.4                   | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 7.6  | 3.3                | 0.7                    | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 8.9  | 8.0                | 1.1                    | 0.3                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 1.6  | 1.4                | -1.0                   | -4.2                   | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 1.3  | 0.9                | -1.1                   | -4.4                   | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 1.4  | 1.4                | -1.1                   | -4.3                   | c                   |
| Shredder FFG (% of community)           | ANOVA                         | log10               | YES                                 | <0.001  | 2008                            | 3               | 40.6 | 4.2                | -                      | 1.6                    | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 28.7 | 7.4                | -2.8                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 22.9 | 4.5                | -4.2                   | -0.8                   | a,b                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 27.4 | 9.4                | -3.1                   | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 31.6 | 7.7                | -2.1                   | 0.4                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 32.8 | 8.2                | -1.8                   | 0.6                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 15.0 | 4.3                | -6.1                   | -1.9                   | b                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 15.8 | 6.4                | -5.9                   | -1.7                   | b                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.31: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 12, August 2020**

| Taxa                        | Study Area<br>Replicate Station | Sheardown Tributary 12 (SDLT12) |     |    |
|-----------------------------|---------------------------------|---------------------------------|-----|----|
|                             |                                 | B1                              | B2  | B3 |
| <b>ROUNDWORMS</b>           |                                 |                                 |     |    |
| <b>P. Nemata</b>            |                                 | 75                              | 47  | 93 |
| <b>ANNELIDS</b>             |                                 |                                 |     |    |
| <b>P. Annelida</b>          |                                 |                                 |     |    |
| <b>WORMS</b>                |                                 |                                 |     |    |
| Cl. Oligochaeta             |                                 |                                 |     |    |
| <b>F. Enchytraeidae</b>     |                                 | 36                              | 47  | 36 |
| <b>F. Lumbriculidae</b>     |                                 |                                 |     |    |
| <i>Lumbriculus</i>          |                                 | 7                               | -   | 7  |
| <b>ARTHROPODS</b>           |                                 |                                 |     |    |
| <b>P. Arthropoda</b>        |                                 |                                 |     |    |
| <b>MITES</b>                |                                 |                                 |     |    |
| Cl. Arachnida               |                                 |                                 |     |    |
| O. Acarina                  |                                 |                                 |     |    |
| immature                    |                                 | -                               | -   | -  |
| <b>F. Lebertiidae</b>       |                                 |                                 |     |    |
| <i>Lebertia</i>             |                                 | -                               | -   | -  |
| <b>F. Sperchonidae</b>      |                                 |                                 |     |    |
| <i>Sperchon</i>             |                                 | 4                               | -   | 4  |
| <b>HARPACTICIDS</b>         |                                 |                                 |     |    |
| O. Harpacticoida            |                                 | -                               | -   | 4  |
| <b>SEED SHRIMPS</b>         |                                 |                                 |     |    |
| Cl. Ostracoda               |                                 | 7                               | 7   | 11 |
| <b>SPRINGTAILS</b>          |                                 |                                 |     |    |
| Cl. Entognatha              |                                 |                                 |     |    |
| O. Collembola               |                                 | -                               | -   | -  |
| <b>INSECTS</b>              |                                 |                                 |     |    |
| Cl. Insecta                 |                                 |                                 |     |    |
| <b>MAYFLIES</b>             |                                 |                                 |     |    |
| O. Ephemeroptera            |                                 |                                 |     |    |
| <b>F. Baetidae</b>          |                                 |                                 |     |    |
| <i>Acentrella feropagus</i> |                                 | -                               | -   | -  |
| <b>CADDISFLIES</b>          |                                 |                                 |     |    |
| O. Trichoptera              |                                 |                                 |     |    |
| <b>F. Apataniidae</b>       |                                 |                                 |     |    |
| <i>Apatania</i>             |                                 | -                               | -   | -  |
| <b>F. Limnephilidae</b>     |                                 |                                 |     |    |
| immature                    |                                 | -                               | -   | 4  |
| <b>TRUE FLIES</b>           |                                 |                                 |     |    |
| O. Diptera                  |                                 |                                 |     |    |
| <b>BITING-MIDGE</b>         |                                 |                                 |     |    |
| <b>F. Ceratopogonidae</b>   |                                 |                                 |     |    |
| <i>Culicoides</i>           |                                 | -                               | -   | -  |
| <b>MIDGES</b>               |                                 |                                 |     |    |
| <b>F. Chironomidae</b>      |                                 |                                 |     |    |
| chironomid pupae            |                                 | 11                              | 7   | 18 |
| <b>S.F. Chironominae</b>    |                                 |                                 |     |    |
| <i>Micropsectra</i>         |                                 | -                               | -   | -  |
| <i>Paratanytarsus</i>       |                                 | -                               | -   | 7  |
| <i>Rheotanytarsus</i>       |                                 | -                               | -   | -  |
| <i>Tanytarsus</i>           |                                 | -                               | -   | -  |
| <b>S.F. Diamesinae</b>      |                                 |                                 |     |    |
| <i>Diamesa</i>              |                                 | -                               | 7   | 4  |
| <i>Pseudokiefferiella</i>   |                                 | -                               | -   | -  |
| <b>S.F. Orthocladiinae</b>  |                                 |                                 |     |    |
| <i>Chaetocladius</i>        |                                 | 68                              | 97  | 68 |
| <i>Corynoneura</i>          |                                 | -                               | -   | -  |
| <i>Cricotopus</i>           |                                 | 115                             | 129 | 22 |

**Table F.31: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 12, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Tributary 12 (SDLT12) |            |            |
|----------------------------------------------------|---------------------------------|---------------------------------|------------|------------|
|                                                    |                                 | B1                              | B2         | B3         |
| <i>Cricotopus/Orthocladius</i>                     |                                 | 68                              | 104        | 183        |
| <i>Diplocladius</i>                                |                                 | 631                             | 423        | 315        |
| <i>Doncricotopus</i>                               |                                 | -                               | -          | -          |
| <i>Eukiefferiella</i>                              |                                 | -                               | -          | -          |
| <i>Hydrobaenus</i>                                 |                                 | 22                              | -          | -          |
| <i>Hydrosmittia</i>                                |                                 | -                               | -          | 68         |
| <i>Krenosmittia</i>                                |                                 | -                               | -          | 7          |
| <i>Limnophyes</i>                                  |                                 | 7                               | 29         | 7          |
| <i>Metriocnemus</i>                                |                                 | -                               | 29         | 22         |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | -                               | -          | -          |
| <i>Parakiefferiella</i>                            |                                 | -                               | -          | -          |
| <i>Paraphaenocladius</i>                           |                                 | 7                               | 22         | 14         |
| <i>Tokunagaia</i>                                  |                                 | 29                              | 233        | 39         |
| <i>Tvetenia</i>                                    |                                 | -                               | 7          | 22         |
| indeterminate                                      |                                 | <b>176</b>                      | <b>104</b> | <b>369</b> |
| <b>S.F. Podonominae</b>                            |                                 |                                 |            |            |
| <i>Trichotanypus</i>                               |                                 | 7                               | -          | 7          |
| <b>S.F. Tanypodinae</b>                            |                                 |                                 |            |            |
| <i>Procladius</i>                                  |                                 | -                               | -          | -          |
| <i>Thienemannimyia</i> complex                     |                                 | -                               | -          | -          |
| <b>F. Dixidae</b>                                  |                                 |                                 |            |            |
| pupae                                              |                                 | -                               | -          | -          |
| <b>F. Empididae</b>                                |                                 |                                 |            |            |
| <i>Clinocera</i>                                   |                                 | -                               | 4          | 4          |
| <b>F. Ephydriidae</b>                              |                                 | -                               | -          | -          |
| <b>F. Muscidae</b>                                 |                                 | -                               | -          | -          |
| <b>F. Simuliidae</b>                               |                                 |                                 |            |            |
| <i>Gymnopaia</i>                                   |                                 | -                               | -          | -          |
| <i>Metacnephia</i>                                 |                                 | -                               | -          | -          |
| <i>Prosimulium</i>                                 |                                 | -                               | -          | -          |
| pupae                                              |                                 | -                               | -          | -          |
| <b>F. Tipulidae</b>                                |                                 |                                 |            |            |
| <i>Dicranota</i>                                   |                                 | -                               | -          | 14         |
| <i>Ormosia</i>                                     |                                 | 4                               | -          | -          |
| <i>Tipula</i>                                      |                                 | 25                              | 14         | -          |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 1,297                           | 1,308      | 1,348      |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 16                              | 14         | 22         |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.759                           | 0.876      | 0.860      |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.489                           | 2.859      | 3.033      |
| <b>Dominant Group Composition</b>                  |                                 |                                 |            |            |
| % Nemata                                           |                                 | 5.8                             | 3.6        | 6.9        |
| % Oligochaeta                                      |                                 | 0.6                             | 0.0        | 0.5        |
| % Hydracarina                                      |                                 | 0.3                             | 0.0        | 0.3        |
| % Ostracods                                        |                                 | 0.6                             | 0.5        | 0.8        |
| % Ephemeroptera                                    |                                 | 0.0                             | 0.0        | 0.0        |
| % Chironomids                                      |                                 | 87.8                            | 91.0       | 87.0       |
| % Metal Sensitive Chironmids                       |                                 | 0.0                             | 0.6        | 0.8        |
| % Simuliidae                                       |                                 | 0.0                             | 0.0        | 0.0        |
| % Tipulidae                                        |                                 | 2.2                             | 1.1        | 1.1        |
| <b>Functional Feeding Group Composition</b>        |                                 |                                 |            |            |
| % Collector - Gatherers                            |                                 | 83.6                            | 80.7       | 82.2       |
| % Filterers                                        |                                 | 0.0                             | 0.0        | 0.5        |
| % Shredders                                        |                                 | 16.2                            | 19.0       | 15.7       |
| <b>Habitat Preference Group Composition</b>        |                                 |                                 |            |            |
| % Clingers                                         |                                 | 14.5                            | 18.2       | 16.2       |
| % Sprawlers                                        |                                 | 74.2                            | 73.6       | 73.7       |
| % Burrowers                                        |                                 | 11.3                            | 8.2        | 10.1       |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.32: Statistical Comparison of Benthic Invertebrate Community Metrics at Sheardown Lake Tributary 12 Upstream (SDLT12) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                                    |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10               | NO                                  | 0.122   | 2007                            | 5               | 1,016 | 669                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 841   | 575                | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 894   | 502                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 783   | 561                | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 2,826 | 2,237              | 2.7                                | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 3,078 | 2,660              | 3.1                                | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 1,318 | 26                 | 0.5                                | a                   |
| Richness (No. of Taxa)                | ANOVA                         | log10               | YES                                 | 0.004   | 2007                            | 5               | 19.0  | 1.9                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 12.0  | 1.0                | -3.7                               | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 18.3  | 1.2                | -0.4                               | ac                  |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 15.3  | 0.6                | -2.0                               | a,b,c               |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 14.3  | 2.5                | -2.5                               | b,c                 |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 15.0  | 2.0                | -2.1                               | a,b,c               |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 17.3  | 4.2                | -0.9                               | a,c                 |
| Simpson's Evenness                    | ANOVA                         | none                | YES                                 | <0.001  | 2007                            | 5               | 0.854 | 0.020              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 0.884 | 0.041              | 1.5                                | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 0.884 | 0.046              | 1.5                                | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 0.931 | 0.021              | 3.9                                | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 0.659 | 0.152              | -9.8                               | b,c                 |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 0.613 | 0.095              | -12.2                              | c                   |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 0.832 | 0.063              | -1.1                               | a,b                 |
| Oligochaeta (% of community)          | K-W                           | rank                | YES                                 | 0.003   | 2007                            | 5               | 0.7   | 0.6                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 28.8  | 8.8                | 48.7                               | b,c                 |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 31.6  | 11.1               | 53.6                               | c                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 21.9  | 8.4                | 36.8                               | b,c                 |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 3.4   | 1.5                | 4.7                                | a,b,c               |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 2.3   | 0.6                | 2.8                                | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 0.4   | 0.3                | -0.6                               | a                   |
| Hydracarina (% of community)          | K-W                           | rank                | NO                                  | 0.156   | 2007                            | 5               | 3.0   | 2.9                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 0.0   | 0.0                | -1.0                               | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 0.4   | 0.4                | -0.9                               | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 0.0   | 0.0                | -1.0                               | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 0.7   | 1.2                | -0.8                               | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 0.4   | 0.7                | -0.9                               | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 0.2   | 0.2                | -0.9                               | a                   |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | <0.001  | 2007                            | 5               | 88.0  | 10.2               | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 65.1  | 6.7                | -2.2                               | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 54.9  | 18.0               | -3.2                               | b                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 64.6  | 7.2                | -2.3                               | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 92.1  | 4.0                | 0.4                                | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 95.1  | 1.9                | 0.7                                | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 88.6  | 2.1                | 0.1                                | a                   |
| Metal Sensitive Taxa (% of community) | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                            | 5               | 3.3   | 2.0                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 3               | 1.4   | 1.5                | -0.9                               | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 3               | 2.6   | 0.5                | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 3               | 12.7  | 5.2                | 4.7                                | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 3               | 0.6   | 0.6                | -1.3                               | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 3               | 2.3   | 3.3                | -0.5                               | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 3               | 0.5   | 0.4                | -1.4                               | a                   |



**Table F.32: Statistical Comparison of Benthic Invertebrate Community Metrics at Sheardown Lake Tributary 12 Upstream (SDLT12) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Tipulidae (% of community)              | ANOVA                         | log10(x+1)          | YES                                 | 0.033   | 2007                            | 5               | 0.3  | 0.5                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 3               | 3.4  | 1.3                | 6.3                                | a,b                 |
|                                         |                               |                     |                                     |         | 2016                            | 3               | 3.8  | 3.1                | 7.2                                | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 3               | 3.4  | 2.0                | 6.5                                | a,b                 |
|                                         |                               |                     |                                     |         | 2018                            | 3               | 2.2  | 1.5                | 3.9                                | a,b                 |
|                                         |                               |                     |                                     |         | 2019                            | 3               | 0.6  | 0.3                | 0.6                                | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 3               | 1.5  | 0.7                | 2.4                                | a,b                 |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.003   | 2007                            | 5               | 57.8 | 15.8               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 3               | 83.7 | 11.4               | 1.6                                | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 3               | 87.0 | 2.6                | 1.8                                | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 3               | 88.5 | 3.2                | 1.9                                | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 3               | 87.6 | 9.4                | 1.9                                | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 3               | 82.0 | 5.0                | 1.5                                | b                   |
|                                         |                               |                     |                                     |         | 2020                            | 3               | 82.2 | 1.4                | 1.5                                | b                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.053   | 2007                            | 5               | 6.9  | 9.2                | -                                  | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 3               | 0.0  | 0.0                | -0.7                               | c                   |
|                                         |                               |                     |                                     |         | 2016                            | 3               | 2.1  | 0.1                | -0.5                               | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 3               | 3.5  | 2.8                | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 3               | 0.4  | 0.4                | -0.7                               | b,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 3               | 2.2  | 3.4                | -0.5                               | a,b,c               |
|                                         |                               |                     |                                     |         | 2020                            | 3               | 0.2  | 0.3                | -0.7                               | c                   |
| Shredder FFG (% of community)           | ANOVA                         | log10               | NO                                  | 0.158   | 2007                            | 5               | 22.5 | 8.9                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 3               | 16.3 | 11.4               | -0.7                               | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 3               | 9.3  | 1.5                | -1.5                               | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 3               | 8.0  | 2.1                | -1.6                               | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 3               | 11.3 | 7.9                | -1.3                               | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 3               | 15.2 | 8.6                | -0.8                               | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 3               | 16.9 | 1.8                | -0.6                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).



**Table F.33: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 9, August 2020**

| Taxa                        | Study Area<br>Replicate Station | Sheardown Lake Tributary 9 (SDLT9) |     |     |     |     |
|-----------------------------|---------------------------------|------------------------------------|-----|-----|-----|-----|
|                             |                                 | B1                                 | B2  | B3  | B4  | B5  |
| <b>ROUNDWORMS</b>           |                                 |                                    |     |     |     |     |
| <b>P. Nemata</b>            |                                 | 108                                | 36  | 57  | 25  | 7   |
| <b>ANNELIDS</b>             |                                 |                                    |     |     |     |     |
| <b>P. Annelida</b>          |                                 |                                    |     |     |     |     |
| <b>WORMS</b>                |                                 |                                    |     |     |     |     |
| Cl. Oligochaeta             |                                 |                                    |     |     |     |     |
| <b>F. Enchytraeidae</b>     |                                 | 79                                 | 29  | 11  | 25  | 25  |
| <b>F. Lumbriculidae</b>     |                                 |                                    |     |     |     |     |
| <i>Lumbriculus</i>          |                                 | -                                  | -   | -   | -   | -   |
| <b>ARTHROPODS</b>           |                                 |                                    |     |     |     |     |
| <b>P. Arthropoda</b>        |                                 |                                    |     |     |     |     |
| <b>MITES</b>                |                                 |                                    |     |     |     |     |
| Cl. Arachnida               |                                 |                                    |     |     |     |     |
| O. Acarina                  |                                 |                                    |     |     |     |     |
| immature                    |                                 | 4                                  | -   | -   | -   | -   |
| <b>F. Lebertiidae</b>       |                                 |                                    |     |     |     |     |
| <i>Lebertia</i>             |                                 | 4                                  | 7   | -   | -   | -   |
| <b>F. Sperchonidae</b>      |                                 |                                    |     |     |     |     |
| <i>Sperchon</i>             |                                 | 79                                 | 161 | 29  | 22  | 57  |
| <b>HARPACTICOIDS</b>        |                                 |                                    |     |     |     |     |
| O. Harpacticoida            |                                 | -                                  | -   | -   | -   | -   |
| <b>SEED SHRIMPS</b>         |                                 |                                    |     |     |     |     |
| Cl. Ostracoda               |                                 | 125                                | 222 | 90  | 61  | 122 |
| <b>SPRINGTAILS</b>          |                                 |                                    |     |     |     |     |
| Cl. Entognatha              |                                 |                                    |     |     |     |     |
| O. Collembola               |                                 | 36                                 | 111 | 100 | 47  | 57  |
| <b>INSECTS</b>              |                                 |                                    |     |     |     |     |
| Cl. Insecta                 |                                 |                                    |     |     |     |     |
| <b>MAYFLIES</b>             |                                 |                                    |     |     |     |     |
| O. Ephemeroptera            |                                 |                                    |     |     |     |     |
| <b>F. Baetidae</b>          |                                 |                                    |     |     |     |     |
| <i>Acentrella feropagus</i> |                                 | 108                                | 11  | -   | 4   | -   |
| <b>CADDISFLIES</b>          |                                 |                                    |     |     |     |     |
| O. Trichoptera              |                                 |                                    |     |     |     |     |
| <b>F. Apataniidae</b>       |                                 |                                    |     |     |     |     |
| <i>Apatania</i>             |                                 | -                                  | -   | -   | -   | -   |
| <b>F. Limnephilidae</b>     |                                 |                                    |     |     |     |     |
| immature                    |                                 | -                                  | 7   | -   | 4   | -   |
| <b>TRUE FLIES</b>           |                                 |                                    |     |     |     |     |
| O. Diptera                  |                                 |                                    |     |     |     |     |
| <b>BITING-MIDGE</b>         |                                 |                                    |     |     |     |     |
| <b>F. Ceratopogonidae</b>   |                                 |                                    |     |     |     |     |
| <i>Culicoides</i>           |                                 | 7                                  | -   | -   | -   | 11  |
| <b>MIDGES</b>               |                                 |                                    |     |     |     |     |
| <b>F. Chironomidae</b>      |                                 |                                    |     |     |     |     |
| chironomid pupae            |                                 | 287                                | 423 | 129 | 125 | 136 |
| S.F. Chironominae           |                                 |                                    |     |     |     |     |
| <i>Micropsectra</i>         |                                 | -                                  | -   | -   | -   | -   |
| <i>Paratanytarsus</i>       |                                 | -                                  | -   | -   | -   | -   |
| <i>Rheotanytarsus</i>       |                                 | -                                  | -   | -   | -   | -   |
| <i>Tanytarsus</i>           |                                 | -                                  | -   | -   | -   | -   |
| S.F. Diamesinae             |                                 |                                    |     |     |     |     |
| <i>Diamesa</i>              |                                 | 190                                | 75  | 14  | -   | 7   |
| <i>Pseudokiefferiella</i>   |                                 | 7                                  | -   | -   | -   | -   |
| S.F. Orthocladiinae         |                                 |                                    |     |     |     |     |
| <i>Chaetocladius</i>        |                                 | -                                  | -   | -   | -   | -   |
| <i>Corynoneura</i>          |                                 | -                                  | -   | -   | 4   | -   |

**Table F.33: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Tributary 9, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Lake Tributary 9 (SDLT9) |           |           |           |           |
|----------------------------------------------------|---------------------------------|------------------------------------|-----------|-----------|-----------|-----------|
|                                                    |                                 | B1                                 | B2        | B3        | B4        | B5        |
| <i>Cricotopus</i>                                  |                                 | 376                                | 566       | 151       | 86        | 151       |
| <i>Cricotopus/Orthocladius</i>                     |                                 | 147                                | 65        | 97        | 50        | 75        |
| <i>Diplocladius</i>                                |                                 | -                                  | -         | 4         | -         | -         |
| <i>Doncricotopus</i>                               |                                 | -                                  | -         | -         | -         | -         |
| <i>Eukiefferiella</i>                              |                                 | 14                                 | -         | -         | -         | -         |
| <i>Hydrobaenus</i>                                 |                                 | -                                  | -         | -         | 11        | -         |
| <i>Hydrosmitia</i>                                 |                                 | 14                                 | 115       | 50        | 25        | 39        |
| <i>Krenosmitia</i>                                 |                                 | 43                                 | 32        | 54        | 79        | 68        |
| <i>Limnophyes</i>                                  |                                 | -                                  | -         | -         | -         | -         |
| <i>Metriocnemus</i>                                |                                 | 14                                 | 7         | -         | -         | -         |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | -                                  | 18        | -         | -         | -         |
| <i>Parakiefferiella</i>                            |                                 | -                                  | 7         | -         | -         | -         |
| <i>Paraphaenocladius</i>                           |                                 | -                                  | -         | -         | -         | -         |
| <i>Tokunagaia</i>                                  |                                 | 14                                 | 7         | -         | -         | -         |
| <i>Tvetenia</i>                                    |                                 | 742                                | 434       | 47        | 287       | 262       |
| indeterminate                                      |                                 | -                                  | <b>57</b> | <b>22</b> | <b>39</b> | <b>25</b> |
| S.F. Podonominae                                   |                                 |                                    |           |           |           |           |
| <i>Trichotanytus</i>                               |                                 | 14                                 | 7         | -         | -         | -         |
| S.F. Tanyptodinae                                  |                                 |                                    |           |           |           |           |
| <i>Procladius</i>                                  |                                 | -                                  | -         | -         | -         | -         |
| <i>Thienemannimyia</i> complex                     |                                 | -                                  | -         | -         | -         | -         |
| <b>F. Dixidae</b>                                  |                                 |                                    |           |           |           |           |
| pupae                                              |                                 | -                                  | -         | -         | -         | -         |
| <b>F. Empididae</b>                                |                                 |                                    |           |           |           |           |
| <i>Clinocera</i>                                   |                                 | 14                                 | 11        | 18        | 22        | 29        |
| <b>F. Ephydriidae</b>                              |                                 | -                                  | -         | 4         | -         | -         |
| <b>F. Muscidae</b>                                 |                                 | 11                                 | -         | -         | -         | -         |
| <b>F. Simuliidae</b>                               |                                 |                                    |           |           |           |           |
| <i>Gymnopaia</i>                                   |                                 | 7                                  | -         | -         | -         | -         |
| <i>Metacnephia</i>                                 |                                 | 22                                 | 7         | -         | -         | -         |
| <i>Prosimulium</i>                                 |                                 | -                                  | -         | -         | -         | -         |
| pupae                                              |                                 | 25                                 | 7         | -         | -         | -         |
| <b>F. Tipulidae</b>                                |                                 |                                    |           |           |           |           |
| <i>Dicranota</i>                                   |                                 | -                                  | -         | -         | 4         | 25        |
| <i>Ormosia</i>                                     |                                 | -                                  | -         | -         | -         | -         |
| <i>Tipula</i>                                      |                                 | 65                                 | 57        | 18        | 47        | 14        |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 2,556                              | 2,480     | 892       | 964       | 1,111     |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 24                                 | 22        | 14        | 16        | 14        |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.841                              | 0.841     | 0.884     | 0.831     | 0.876     |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.106                              | 2.974     | 3.015     | 2.855     | 2.920     |
| <b>Dominant Group Composition</b>                  |                                 |                                    |           |           |           |           |
| % Nemata                                           |                                 | 4.2                                | 1.4       | 6.4       | 2.6       | 0.6       |
| % Oligochaeta                                      |                                 | 0.0                                | 0.0       | 0.0       | 0.0       | 0.0       |
| % Hydracarina                                      |                                 | 3.4                                | 6.8       | 3.2       | 2.2       | 5.2       |
| % Ostracods                                        |                                 | 4.9                                | 9.0       | 10.0      | 6.3       | 11.0      |
| % Chironomids                                      |                                 | 72.9                               | 73.1      | 63.5      | 73.2      | 68.7      |
| % Metal Sensitive Chironomids                      |                                 | 9.1                                | 4.0       | 2.1       | 0.0       | 0.8       |
| % Simuliidae                                       |                                 | 2.1                                | 0.6       | 0.0       | 0.0       | 0.0       |
| % Tipulidae                                        |                                 | 2.5                                | 2.3       | 2.0       | 5.2       | 3.5       |
| <b>Functional Feeding Group Composition</b>        |                                 |                                    |           |           |           |           |
| % Collector - Gatherers                            |                                 | 66.5                               | 56.5      | 56.5      | 72.8      | 63.0      |
| % Filterers                                        |                                 | 1.8                                | 0.6       | 0.0       | 0.0       | 0.0       |
| % Shredders                                        |                                 | 26.7                               | 35.7      | 38.3      | 22.4      | 26.0      |
| <b>Habitat Preference Group Composition</b>        |                                 |                                    |           |           |           |           |
| % Clingers                                         |                                 | 30.2                               | 41.2      | 41.1      | 22.0      | 32.5      |
| % Sprawlers                                        |                                 | 57.8                               | 49.5      | 37.6      | 63.1      | 57.2      |
| % Burrowers                                        |                                 | 10.5                               | 4.9       | 10.0      | 10.0      | 5.2       |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.34:** Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 9 (SDLT9) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2013) for the Mary River Project CREMP

| Metric                                | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2013 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | none                | YES                                 | 0.029   | 2007                            | 3               | 712   | 42                 | -                      | -0.8                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 1,240 | 690                | 12.6                   | -                      | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2,147 | 942                | 34.2                   | 1.3                    | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 2,401 | 1,054              | 40.3                   | 1.7                    | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 3,404 | 1,983              | 64.2                   | 3.1                    | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1,482 | 375                | 18.4                   | 0.4                    | a,b                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1,575 | 705                | 20.6                   | 0.5                    | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 1,601 | 841                | 21.2                   | 0.5                    | a,b                 |
| Richness (No. of Taxa)                | ANOVA                         | none                | NO                                  | 0.543   | 2007                            | 3               | 22.3  | 3.2                | -                      | 0.9                    | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 19.0  | 3.6                | -1.0                   | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 19.4  | 4.8                | -0.9                   | 0.1                    | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 18.2  | 2.6                | -1.3                   | -0.2                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 20.8  | 2.8                | -0.5                   | 0.5                    | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 17.8  | 3.9                | -1.4                   | -0.3                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 21.0  | 2.0                | -0.4                   | 0.6                    | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 18.0  | 4.7                | -1.3                   | -0.3                   | a                   |
| Simpson's Evenness                    | ANOVA                         | none                | NO                                  | 0.421   | 2007                            | 3               | 0.865 | 0.049              | -                      | -1.9                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 0.899 | 0.018              | 0.7                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.892 | 0.060              | 0.6                    | -0.4                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.843 | 0.064              | -0.4                   | -3.1                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.883 | 0.042              | 0.4                    | -0.9                   | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.889 | 0.047              | 0.5                    | -0.6                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.899 | 0.008              | 0.7                    | 0.0                    | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.855 | 0.024              | -0.2                   | -2.4                   | a                   |
| Oligochaeta (% of community)          | K-W                           | rank                | YES                                 | 0.009   | 2007                            | 3               | 5.9   | 4.1                | -                      | 4.7                    | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 0.7   | 1.1                | -1.3                   | -                      | b,c                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.8   | 0.4                | -1.3                   | 0.2                    | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1.5   | 1.0                | -1.1                   | 0.8                    | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 3.0   | 2.8                | -0.7                   | 2.0                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.9   | 1.0                | -1.2                   | 0.3                    | b,c                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2.1   | 1.7                | -0.9                   | 1.3                    | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.0   | 0.0                | -1.5                   | -0.6                   | c                   |
| Hydracarina (% of community)          | ANOVA                         | log10               | YES                                 | 0.052   | 2007                            | 3               | 3.4   | 2.0                | -                      | -1.3                   | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 9.0   | 4.2                | 2.8                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 4.2   | 4.1                | 0.4                    | -1.1                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 4.6   | 3.2                | 0.6                    | -1.0                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 3.3   | 2.0                | -0.1                   | -1.4                   | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 8.5   | 2.3                | 2.6                    | -0.1                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2.7   | 1.1                | -0.3                   | -1.5                   | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 4.2   | 1.8                | 0.4                    | -1.2                   | a                   |
| Chironomidae (% of community)         | K-W                           | rank                | NO                                  | 0.154   | 2007                            | 3               | 77.5  | 5.8                | -                      | 0.9                    | a                   |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 73.3  | 4.4                | -0.7                   | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 78.7  | 8.7                | 0.2                    | 1.2                    | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 67.1  | 8.8                | -1.8                   | -1.4                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 73.4  | 10.1               | -0.7                   | 0.0                    | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 75.8  | 11.1               | -0.3                   | 0.6                    | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 63.7  | 6.9                | -2.4                   | -2.2                   | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 70.3  | 4.3                | -1.2                   | -0.7                   | a                   |
| Metal Sensitive Taxa (% of community) | K-W                           | rank                | YES                                 | 0.022   | 2007                            | 3               | 2.6   | 0.9                | -                      | 2.9                    | a,b                 |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 1.0   | 0.5                | -1.8                   | -                      | b,c,d               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 5.0   | 2.5                | 2.8                    | 7.4                    | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.8   | 1.2                | -2.1                   | -0.4                   | d                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 1.1   | 1.3                | -1.7                   | 0.2                    | b,c,d               |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.8   | 0.6                | -2.0                   | -0.3                   | c,d                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2.5   | 1.1                | -0.1                   | 2.8                    | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 3.2   | 3.6                | 0.7                    | 4.0                    | a,b,c               |
| Tipulidae (% of community)            | ANOVA                         | log10               | YES                                 | 0.029   | 2007                            | 3               | 4.6   | 1.9                | -                      | 0.1                    | a,b                 |
|                                       |                               |                     |                                     |         | 2013                            | 3               | 4.4   | 2.1                | -0.1                   | -                      | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 3.9   | 3.4                | -0.4                   | -0.2                   | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 8.0   | 3.3                | 1.8                    | 1.7                    | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 5.8   | 5.6                | 0.7                    | 0.7                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 3.6   | 2.3                | -0.5                   | -0.4                   | a,b                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1.4   | 0.8                | -1.7                   | -1.5                   | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 3.1   | 1.3                | -0.8                   | -0.6                   | a,b                 |

**Table F.34:** Statistical Comparison of Benthic Metrics at Sheardown Lake Tributary 9 (SDLT9) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2013) for the Mary River Project CREMP

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2007 | vs. Baseline Year 2013 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | NO                                  | 0.267   | 2007                            | 3               | 57.8 | 3.1                | -                      | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 60.6 | 6.9                | 0.9                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 60.7 | 20.5               | 0.9                    | 0.0                    | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 44.6 | 15.7               | -4.3                   | -2.3                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 57.5 | 11.6               | -0.1                   | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 52.6 | 7.3                | -1.7                   | -1.2                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 62.5 | 6.5                | 1.5                    | 0.3                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 63.1 | 6.9                | 1.7                    | 0.4                    | a                   |
| Filterer FFG (% of community)           | ANOVA                         | log10(x+1)          | NO                                  | 0.140   | 2007                            | 3               | 1.3  | 0.9                | -                      | -0.7                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 1.9  | 0.9                | 0.6                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 2.0  | 1.8                | 0.7                    | 0.1                    | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 0.5  | 0.4                | -0.9                   | -1.6                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.8  | 0.7                | -0.6                   | -1.3                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 1.4  | 1.4                | 0.1                    | -0.6                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 2.0  | 1.0                | 0.7                    | 0.1                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.5  | 0.8                | -0.9                   | -1.6                   | a                   |
| Shredder FFG (% of community)           | ANOVA                         | log10               | NO                                  | 0.143   | 2007                            | 3               | 26.8 | 3.9                | -                      | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 3               | 28.4 | 4.4                | 0.4                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 32.0 | 18.2               | 1.3                    | 0.8                    | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 49.1 | 15.0               | 5.7                    | 4.7                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 37.7 | 10.7               | 2.8                    | 2.1                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 37.2 | 9.7                | 2.7                    | 2.0                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 32.0 | 7.2                | 1.3                    | 0.8                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 29.8 | 6.8                | 0.8                    | 0.3                    | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.35: Statistical Comparison of Sediment Physical Properties Between Sheardown Lake NW (DL0-1) and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results      |                     |                                       |         | Summary Statistics |                 |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-------------------------------|---------------------|---------------------------------------|---------|--------------------|-----------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference between Areas? | P-value | Study Lake         | Sample Size (n) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.264   | Reference          | 5               | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 45.1 | 27.9               | 12.5           | 22.9    | 93.0    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.159   | Reference          | 5               | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 45.5 | 23.3               | 10.4           | 6.4     | 67.1    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.640   | Reference          | 5               | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 9.5  | 5.0                | 2.2            | 1.0     | 13.6    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.092   | Reference          | 5               | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 67.7 | 23.2               | 10.4           | 27.4    | 84.3    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.076   | Reference          | 5               | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 2.5  | 1.6                | 0.7            | 0.2     | 4.3     |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.113   | Reference          | 5               | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 13.3 | 5.3                | 2.4            | 8.5     | 19.5    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.109   | Reference          | 5               | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 72.6 | 5.2                | 2.3            | 64.4    | 78.9    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.272   | Reference          | 5               | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 14.1 | 3.9                | 1.7            | 8.8     | 17.2    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | <0.001  | Reference          | 5               | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 68.7 | 2.7                | 1.2            | 64.3    | 70.9    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.006   | Reference          | 5               | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                               |                     |                                       |         | Sheardown NW       | 5               | 1.6  | 0.3                | 0.1            | 1.3     | 2.0     |

Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table F.36: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Northwest, August 2020**

| Taxa                      | Study Area<br>Replicate Station | Sheardown Lake NW - Littoral Stations |         |         |          |          |
|---------------------------|---------------------------------|---------------------------------------|---------|---------|----------|----------|
|                           |                                 | DLO-1-9                               | DLO-1-4 | DLO-1-3 | DLO-1-11 | DLO-1-10 |
| <b>ROUNDWORMS</b>         |                                 |                                       |         |         |          |          |
| P. Nemata                 |                                 | 69                                    | -       | -       | 26       | 34       |
| <b><u>ANNELIDS</u></b>    |                                 |                                       |         |         |          |          |
| P. Annelida               |                                 |                                       |         |         |          |          |
| <b>WORMS</b>              |                                 |                                       |         |         |          |          |
| Cl. Oligochaeta           |                                 |                                       |         |         |          |          |
| <b>F. Enchytraeidae</b>   |                                 | -                                     | -       | 17      | -        | -        |
| <b>F. Lumbriculidae</b>   |                                 |                                       |         |         |          |          |
| <i>Lumbriculus</i>        |                                 | -                                     | 34      | 17      | -        | -        |
| <b><u>ARTHROPODS</u></b>  |                                 |                                       |         |         |          |          |
| P. Arthropoda             |                                 |                                       |         |         |          |          |
| <b>MITES</b>              |                                 |                                       |         |         |          |          |
| Cl. Arachnida             |                                 |                                       |         |         |          |          |
| O. Acarina                |                                 |                                       |         |         |          |          |
| immature                  |                                 | -                                     | -       | -       | -        | -        |
| <b>F. Acalyptonotidae</b> |                                 |                                       |         |         |          |          |
| <i>Acalyptonotus</i>      |                                 | -                                     | 17      | 17      | 86       | 52       |
| <b>F. Hygrobatidae</b>    |                                 |                                       |         |         |          |          |
| <i>Hygrobates</i>         |                                 | 17                                    | 17      | -       | 69       | 103      |
| <b>F. Lebertiidae</b>     |                                 |                                       |         |         |          |          |
| <i>Lebertia</i>           |                                 | -                                     | -       | -       | 26       | 17       |
| <b>F. Sperchontidae</b>   |                                 |                                       |         |         |          |          |
| <i>Sperchon</i>           |                                 | -                                     | -       | -       | -        | -        |
| <b>HARPACTICIDS</b>       |                                 |                                       |         |         |          |          |
| O. Harpacticoida          |                                 | -                                     | 17      | 17      | -        | -        |
| <b>SEED SHRIMPS</b>       |                                 |                                       |         |         |          |          |
| Cl. Ostracoda             |                                 | 1,810                                 | 4,500   | 1,086   | 664      | 845      |
| <b><u>INSECTS</u></b>     |                                 |                                       |         |         |          |          |
| Cl. Insecta               |                                 |                                       |         |         |          |          |
| <b>CADDISFLIES</b>        |                                 |                                       |         |         |          |          |
| O. Trichoptera            |                                 |                                       |         |         |          |          |
| <b>F. Apataniidae</b>     |                                 |                                       |         |         |          |          |
| <i>Apatania</i>           |                                 | 34                                    | 34      | 121     | 17       | -        |
| <b>F. Limnephilidae</b>   |                                 |                                       |         |         |          |          |
| <i>Grensia praeterita</i> |                                 | -                                     | -       | -       | -        | -        |
| <b>TRUE FLIES</b>         |                                 |                                       |         |         |          |          |
| O. Diptera                |                                 |                                       |         |         |          |          |
| <b>MIDGES</b>             |                                 |                                       |         |         |          |          |
| <b>F. Chironomidae</b>    |                                 |                                       |         |         |          |          |
| chironomid pupae          |                                 | -                                     | 17      | 17      | -        | 52       |
| <b>S.F. Chironominae</b>  |                                 |                                       |         |         |          |          |
| <i>Chironomus</i>         |                                 | -                                     | -       | 34      | -        | -        |
| <i>Micropsectra</i>       |                                 | 224                                   | 181     | 448     | 17       | 17       |

**Table F.36: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Northwest, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Lake NW - Littoral Stations |         |           |          |          |
|----------------------------------------------------|---------------------------------|---------------------------------------|---------|-----------|----------|----------|
|                                                    |                                 | DLO-1-9                               | DLO-1-4 | DLO-1-3   | DLO-1-11 | DLO-1-10 |
| <i>Paratanytarsus</i>                              |                                 | 784                                   | 1,284   | 1,966     | 26       | -        |
| <i>Sergentia</i>                                   |                                 | 112                                   | 34      | -         | -        | -        |
| <i>Stictochironomus</i>                            |                                 | 2,586                                 | 4,655   | 2,422     | 1,060    | 2,138    |
| <i>Tanytarsus</i>                                  |                                 | 336                                   | 181     | 388       | -        | 34       |
| <b>S.F. Diamesinae</b>                             |                                 |                                       |         |           |          |          |
| <i>Diamesa</i>                                     |                                 | -                                     | -       | -         | -        | -        |
| <i>Protanypus</i>                                  |                                 | 34                                    | 147     | 34        | 9        | 34       |
| <i>Pseudodiamesa</i>                               |                                 | -                                     | -       | -         | -        | 17       |
| <b>S.F. Orthoclaadiinae</b>                        |                                 |                                       |         |           |          |          |
| <i>Abiskomyia</i>                                  |                                 | 112                                   | 224     | 34        | -        | 34       |
| <i>Heterotrissocladius</i>                         |                                 | 147                                   | 810     | 560       | 95       | 328      |
| <i>Hydrobaenus</i>                                 |                                 | -                                     | -       | -         | -        | -        |
| <i>Mesocricotopus</i>                              |                                 | -                                     | -       | -         | -        | -        |
| <i>Paracladius</i>                                 |                                 | -                                     | -       | -         | 17       | 224      |
| <i>Parakiefferiella</i>                            |                                 | -                                     | -       | -         | 9        | 52       |
| <i>Psectrocladius</i>                              |                                 | -                                     | -       | -         | -        | -        |
| <i>Zalutschia</i>                                  |                                 | -                                     | -       | -         | 9        | -        |
| Orthoclaadiinae indeterminate                      |                                 | -                                     | -       | <b>34</b> | -        | -        |
| <b>S.F. Tanypodinae</b>                            |                                 |                                       |         |           |          |          |
| <i>Arctopelopia</i>                                |                                 | 112                                   | 328     | 560       | -        | -        |
| <i>Procladius</i>                                  |                                 | 78                                    | 17      | 34        | 121      | 155      |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 6,457                                 | 12,500  | 7,810     | 2,250    | 4,138    |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 14                                    | 16      | 17        | 15       | 15       |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.798                                 | 0.762   | 0.854     | 0.732    | 0.718    |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.481                                 | 2.273   | 2.764     | 2.260    | 2.283    |
| <b>Dominant Taxonomic Group Composition</b>        |                                 |                                       |         |           |          |          |
| % Nemata                                           |                                 | 1.1                                   | 0.0     | 0.0       | 1.1      | 0.8      |
| % Hydracarina                                      |                                 | 0.3                                   | 0.3     | 0.2       | 8.0      | 4.2      |
| % Ostracods                                        |                                 | 28.0                                  | 36.0    | 13.9      | 29.5     | 20.4     |
| % Chironomids                                      |                                 | 70.1                                  | 63.0    | 83.7      | 60.5     | 74.6     |
| % Metal Sensitive Chironmids                       |                                 | 21.4                                  | 14.4    | 36.4      | 2.3      | 2.5      |
| <b>Functional Feeding Group Composition</b>        |                                 |                                       |         |           |          |          |
| % Collector - Gatherers                            |                                 | 75.4                                  | 83.5    | 54.2      | 83.5     | 90.7     |
| % Filterers                                        |                                 | 20.8                                  | 13.2    | 36.0      | 1.9      | 1.3      |
| % Shredders                                        |                                 | 0.0                                   | 0.0     | 0.4       | 0.4      | 0.0      |
| <b>Habitat Preference Group Composition</b>        |                                 |                                       |         |           |          |          |
| % Clingers                                         |                                 | 11.2                                  | 3.7     | 12.5      | 9.6      | 5.4      |
| % Sprawlers                                        |                                 | 47.1                                  | 57.5    | 55.1      | 41.8     | 40.3     |
| % Burrowers                                        |                                 | 41.7                                  | 38.8    | 32.4      | 48.7     | 54.2     |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.36: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Northwest, August 2020**

| Taxa                                   | Study Area        |         |          |          |         |          |
|----------------------------------------|-------------------|---------|----------|----------|---------|----------|
|                                        | Replicate Station | DLO-1-5 | DLO-1-14 | DLO-1-15 | DLO-1-2 | DLO-1-12 |
| Sheardown Lake NW - Profundal Stations |                   |         |          |          |         |          |
|                                        |                   |         |          |          |         |          |
| ROUNDWORMS                             |                   |         |          |          |         |          |
| P. Nemata                              | -                 | -       | -        | -        | -       |          |
| ANNELIDS                               |                   |         |          |          |         |          |
| P. Annelida                            |                   |         |          |          |         |          |
| WORMS                                  |                   |         |          |          |         |          |
| Cl. Oligochaeta                        |                   |         |          |          |         |          |
| F. Enchytraeidae                       | -                 | -       | -        | -        | -       |          |
| F. Lumbriculidae                       |                   |         |          |          |         |          |
| Lumbriculus                            | -                 | -       | -        | -        | -       |          |
| ARTHROPODS                             |                   |         |          |          |         |          |
| P. Arthropoda                          |                   |         |          |          |         |          |
| MITES                                  |                   |         |          |          |         |          |
| Cl. Arachnida                          |                   |         |          |          |         |          |
| O. Acarina                             |                   |         |          |          |         |          |
| immature                               | -                 | -       | -        | -        | -       |          |
| F. Acalyptonotidae                     |                   |         |          |          |         |          |
| Acalyptonotus                          | 9                 | 17      | 17       | 9        | 9       |          |
| F. Hygrobatidae                        |                   |         |          |          |         |          |
| Hygrobates                             | 9                 | 17      | 9        | 26       | -       |          |
| F. Lebertiidae                         |                   |         |          |          |         |          |
| Lebertia                               | 9                 | -       | -        | 9        | 17      |          |
| F. Sperchontidae                       |                   |         |          |          |         |          |
| Sperchon                               | -                 | -       | -        | -        | -       |          |
| HARPACTICIDS                           |                   |         |          |          |         |          |
| O. Harpacticoida                       | -                 | -       | -        | -        | -       |          |
| SEED SHRIMPS                           |                   |         |          |          |         |          |
| Cl. Ostracoda                          | 69                | 190     | 9        | 78       | 121     |          |
| INSECTS                                |                   |         |          |          |         |          |
| Cl. Insecta                            |                   |         |          |          |         |          |
| CADDISFLIES                            |                   |         |          |          |         |          |
| O. Trichoptera                         |                   |         |          |          |         |          |
| F. Apataniidae                         |                   |         |          |          |         |          |
| Apatania                               | -                 | -       | -        | -        | -       |          |
| F. Limnephilidae                       |                   |         |          |          |         |          |
| Grensia praeterita                     | -                 | -       | -        | -        | -       |          |
| TRUE FLIES                             |                   |         |          |          |         |          |
| O. Diptera                             |                   |         |          |          |         |          |
| MIDGES                                 |                   |         |          |          |         |          |
| F. Chironomidae                        |                   |         |          |          |         |          |
| chironomid pupae                       | -                 | 52      | -        | -        | 9       |          |
| S.F. Chironominae                      |                   |         |          |          |         |          |
| Chironomus                             | 112               | 862     | -        | -        | -       |          |
| Micropsectra                           | 9                 | -       | -        | -        | -       |          |



**Table F.36: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Northwest, August 2020**

| Taxa                                         | Study Area        | Sheardown Lake NW - Profundal Stations |          |          |         |          |
|----------------------------------------------|-------------------|----------------------------------------|----------|----------|---------|----------|
|                                              | Replicate Station | DLO-1-5                                | DLO-1-14 | DLO-1-15 | DLO-1-2 | DLO-1-12 |
| <hr/>                                        |                   |                                        |          |          |         |          |
| <i>Paratanytarsus</i>                        |                   | -                                      | 17       | -        | -       | -        |
| <i>Sergentia</i>                             |                   | 17                                     | -        | -        | -       | -        |
| <i>Stictochironomus</i>                      |                   | 259                                    | 259      | -        | -       | -        |
| <i>Tanytarsus</i>                            |                   | -                                      | 155      | -        | -       | -        |
| <b>S.F. Diamesinae</b>                       |                   |                                        |          |          |         |          |
| <i>Diamesa</i>                               |                   | -                                      | -        | -        | -       | -        |
| <i>Protanypus</i>                            |                   | 17                                     | -        | 17       | 34      | 26       |
| <i>Pseudodiamesa</i>                         |                   | -                                      | -        | -        | -       | -        |
| <b>S.F. Orthoclaadiinae</b>                  |                   |                                        |          |          |         |          |
| <i>Abiskomyia</i>                            |                   | 69                                     | 52       | -        | -       | -        |
| <i>Heterotrissocladius</i>                   |                   | 216                                    | -        | 707      | 1,138   | 1,810    |
| <i>Hydrobaenus</i>                           |                   | -                                      | -        | -        | -       | -        |
| <i>Mesocricotopus</i>                        |                   | -                                      | -        | -        | -       | -        |
| <i>Paracladius</i>                           |                   | -                                      | -        | -        | -       | -        |
| <i>Parakiefferiella</i>                      |                   | -                                      | -        | -        | -       | -        |
| <i>Psectrocladius</i>                        |                   | -                                      | -        | -        | -       | -        |
| <i>Zalutschia</i>                            |                   | -                                      | -        | -        | -       | -        |
| Orthoclaadiinae indeterminate                |                   | -                                      | -        | -        | -       | -        |
| <b>S.F. Tanypodinae</b>                      |                   |                                        |          |          |         |          |
| <i>Arctopelopia</i>                          |                   | -                                      | -        | -        | -       | -        |
| <i>Procladius</i>                            |                   | 34                                     | -        | 43       | 52      | 43       |
| <hr/>                                        |                   |                                        |          |          |         |          |
| Density (No. organisms per m <sup>2</sup> )  |                   | 831                                    | 1,627    | 805      | 1,350   | 2,043    |
| Richness (total number of taxa) <sup>a</sup> |                   | 12                                     | 8        | 6        | 7       | 6        |
| Simpson's Evenness (E)                       |                   | 0.872                                  | 0.734    | 0.262    | 0.324   | 0.236    |
| Shannon-Wiener Diversity                     |                   | 2.716                                  | 1.970    | 0.766    | 0.961   | 0.677    |
| <b>Dominant Taxonomic Group Composition</b>  |                   |                                        |          |          |         |          |
| % Nemata                                     |                   | 0.0                                    | 0.0      | 0.0      | 0.0     | 0.0      |
| % Hydracarina                                |                   | 3.1                                    | 2.1      | 3.2      | 3.2     | 1.3      |
| % Ostracods                                  |                   | 8.3                                    | 11.7     | 1.1      | 5.8     | 5.9      |
| % Chironomids                                |                   | 88.5                                   | 86.2     | 95.7     | 91.0    | 92.8     |
| % Metal Sensitive Chironmids                 |                   | 3.1                                    | 11.0     | 2.2      | 2.6     | 1.3      |
| <b>Functional Feeding Group Composition</b>  |                   |                                        |          |          |         |          |
| % Collector - Gatherers                      |                   | 91.7                                   | 86.8     | 91.4     | 92.9    | 96.6     |
| % Filterers                                  |                   | 1.0                                    | 11.0     | 0.0      | 0.0     | 0.0      |
| % Shredders                                  |                   | 0.0                                    | 0.0      | 0.0      | 0.0     | 0.0      |
| <b>Habitat Preference Group Composition</b>  |                   |                                        |          |          |         |          |
| % Clingers                                   |                   | 6.3                                    | 12.1     | 3.2      | 3.2     | 1.3      |
| % Sprawlers                                  |                   | 46.9                                   | 16.1     | 94.6     | 94.2    | 97.5     |
| % Burrowers                                  |                   | 46.9                                   | 71.8     | 2.2      | 2.6     | 1.3      |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.37:** Statistical Comparison of Benthic Metrics at Sheardown Lake NW Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2008, 2013) for the Mary River Project CREMP

| Metric                            | Overall 9-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                        |                        |                        |                     |
|-----------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------|------------------------|------------------------|---------------------|
|                                   | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        |                        | Pairwise Comparison |
|                                   |                               |                     |                                     |         |                                              |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2008 | vs. Baseline Year 2013 |                     |
| Density (No. per m <sup>2</sup> ) | ANOVA                         | log10               | NO                                  | 0.835   | 2007                                         | 4               | 5,974 | 3,000              | -                      | -0.3                   | -1.5                   | a                   |
|                                   |                               |                     |                                     |         | 2008                                         | 4               | 7,536 | 5,273              | 0.5                    | -                      | -0.9                   | a                   |
|                                   |                               |                     |                                     |         | 2013                                         | 3               | 9,940 | 2,634              | 1.3                    | 0.5                    | -                      | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 5,665 | 3,230              | -0.1                   | -0.4                   | -1.6                   | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 5,503 | 4,184              | -0.2                   | -0.4                   | -1.7                   | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 5,216 | 2,398              | -0.3                   | -0.4                   | -1.8                   | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 6,334 | 3,717              | 0.1                    | -0.2                   | -1.4                   | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 6,207 | 2,673              | 0.1                    | -0.3                   | -1.4                   | a                   |
| Richness (No. of Taxa)            | ANOVA                         | log10               | NO                                  | 0.181   | 2007                                         | 4               | 12.3  | 1.5                | -                      | -1.3                   | -1.7                   | a                   |
|                                   |                               |                     |                                     |         | 2008                                         | 4               | 14.5  | 1.7                | 1.4                    | -                      | -1.0                   | a                   |
|                                   |                               |                     |                                     |         | 2013                                         | 3               | 17.7  | 3.2                | 3.5                    | 1.9                    | -                      | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 13.8  | 1.9                | 1.0                    | -0.4                   | -1.2                   | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 14.6  | 2.4                | 1.5                    | 0.1                    | -1.0                   | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 14.0  | 3.2                | 1.1                    | -0.3                   | -1.1                   | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 15.0  | 1.2                | 1.8                    | 0.3                    | -0.8                   | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 13.2  | 3.6                | 0.6                    | -0.8                   | -1.4                   | a                   |
| Simpson's Evenness                | ANOVA                         | log10               | YES                                 | 0.038   | 2007                                         | 4               | 0.768 | 0.055              | -                      | -0.7                   | -2.0                   | ab                  |
|                                   |                               |                     |                                     |         | 2008                                         | 4               | 0.840 | 0.098              | 1.3                    | -                      | -0.5                   | ab                  |
|                                   |                               |                     |                                     |         | 2013                                         | 3               | 0.863 | 0.047              | 1.7                    | 0.2                    | -                      | ab                  |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.759 | 0.096              | -0.2                   | -0.8                   | -2.2                   | ab                  |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 0.893 | 0.024              | 2.3                    | 0.5                    | 0.6                    | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 0.842 | 0.048              | 1.3                    | 0.0                    | -0.5                   | ab                  |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 0.769 | 0.163              | 0.0                    | -0.7                   | -2.0                   | ab                  |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 0.686 | 0.114              | -1.5                   | -1.6                   | -3.8                   | b                   |
| Nemata (% of community)           | ANOVA                         | log10(x+1)          | NO                                  | 0.592   | 2007                                         | 4               | 1.5   | 1.6                | -                      | 0.4                    | 1.1                    | a                   |
|                                   |                               |                     |                                     |         | 2008                                         | 4               | 1.1   | 1.0                | -0.3                   | -                      | 0.6                    | a                   |
|                                   |                               |                     |                                     |         | 2013                                         | 3               | 0.6   | 0.8                | -0.6                   | -0.5                   | -                      | a                   |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 0.9   | 1.1                | -0.4                   | -0.2                   | 0.3                    | a                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 1.1   | 0.7                | -0.2                   | 0.1                    | 0.6                    | a                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 1.3   | 1.5                | -0.2                   | 0.2                    | 0.8                    | a                   |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 1.3   | 1.0                | -0.1                   | 0.3                    | 0.9                    | a                   |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 0.2   | 0.2                | -0.9                   | -0.9                   | -0.5                   | a                   |
| Ostracoda (% of community)        | ANOVA                         | none                | YES                                 | 0.018   | 2007                                         | 4               | 11.9  | 12.8               | -                      | 0.1                    | -1.4                   | ab                  |
|                                   |                               |                     |                                     |         | 2008                                         | 4               | 10.8  | 8.7                | -0.1                   | -                      | -1.5                   | ab                  |
|                                   |                               |                     |                                     |         | 2013                                         | 3               | 23.4  | 8.1                | 0.9                    | 1.4                    | -                      | ab                  |
|                                   |                               |                     |                                     |         | 2015                                         | 5               | 7.8   | 3.7                | -0.3                   | -0.3                   | -1.9                   | b                   |
|                                   |                               |                     |                                     |         | 2016                                         | 5               | 9.2   | 6.1                | -0.2                   | -0.2                   | -1.7                   | b                   |
|                                   |                               |                     |                                     |         | 2017                                         | 5               | 19.5  | 11.1               | 0.6                    | 1.0                    | -0.5                   | ab                  |
|                                   |                               |                     |                                     |         | 2018                                         | 5               | 13.0  | 4.1                | 0.1                    | 0.2                    | -1.3                   | ab                  |
|                                   |                               |                     |                                     |         | 2019                                         | 5               | 16.0  | 5.7                | 0.3                    | 0.6                    | -0.9                   | ab                  |
|                                   |                               |                     |                                     |         | 2020                                         | 5               | 25.6  | 8.6                | 1.1                    | 1.7                    | 0.3                    | a                   |

**Table F.37:** Statistical Comparison of Benthic Metrics at Sheardown Lake NW Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2008, 2013) for the Mary River Project CREMP

| Metric                                  | Overall 9-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                        |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                              |                 |      |                    | vs. Baseline Year 2007 | vs. Baseline Year 2008 | vs. Baseline Year 2013 |                     |
| Chironomidae (% of community)           | ANOVA                         | log10               | YES                                 | 0.003   | 2007                                         | 4               | 83.0 | 8.3                | -                      | 0.3                    | 1.3                    | abc                 |
|                                         |                               |                     |                                     |         | 2008                                         | 4               | 81.2 | 6.7                | -0.2                   | -                      | 1.1                    | abc                 |
|                                         |                               |                     |                                     |         | 2013                                         | 3               | 70.5 | 9.6                | -1.5                   | -1.6                   | -                      | bc                  |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 89.8 | 3.2                | 0.8                    | 1.3                    | 2.0                    | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 85.0 | 6.6                | 0.2                    | 0.6                    | 1.5                    | ab                  |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 73.5 | 11.2               | -1.1                   | -1.2                   | 0.3                    | bc                  |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 83.7 | 2.9                | 0.1                    | 0.4                    | 1.4                    | abc                 |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 82.1 | 5.9                | -0.1                   | 0.1                    | 1.2                    | abc                 |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 70.4 | 9.3                | -1.5                   | -1.6                   | 0.0                    | c                   |
| Metal Sensitive Taxa (% of community)   | ANOVA                         | log10               | NO                                  | 0.804   | 2007                                         | 4               | 16.9 | 16.8               | -                      | -0.2                   | -0.9                   | a                   |
|                                         |                               |                     |                                     |         | 2008                                         | 4               | 20.7 | 17.2               | 0.2                    | -                      | -0.1                   | a                   |
|                                         |                               |                     |                                     |         | 2013                                         | 3               | 21.0 | 4.6                | 0.2                    | 0.0                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 19.1 | 7.2                | 0.1                    | -0.1                   | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 24.6 | 15.2               | 0.5                    | 0.2                    | 0.8                    | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 16.6 | 7.9                | 0.0                    | -0.2                   | -0.9                   | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 18.3 | 15.0               | 0.1                    | -0.1                   | -0.6                   | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 10.7 | 6.0                | -0.4                   | -0.6                   | -2.2                   | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 15.4 | 14.3               | -0.1                   | -0.3                   | -1.2                   | a                   |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.034   | 2007                                         | 4               | 71.6 | 13.5               | -                      | 0.7                    | 0.7                    | ab                  |
|                                         |                               |                     |                                     |         | 2008                                         | 4               | 61.1 | 15.0               | -0.8                   | -                      | -0.5                   | ab                  |
|                                         |                               |                     |                                     |         | 2013                                         | 3               | 65.3 | 9.0                | -0.5                   | 0.3                    | -                      | ab                  |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 68.9 | 8.0                | -0.2                   | 0.5                    | 0.4                    | ab                  |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 56.8 | 7.7                | -1.1                   | -0.3                   | -1.0                   | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 69.4 | 9.2                | -0.2                   | 0.6                    | 0.5                    | ab                  |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 76.2 | 13.1               | 0.3                    | 1.0                    | 1.2                    | ab                  |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 81.7 | 8.4                | 0.8                    | 1.4                    | 1.8                    | b                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 77.5 | 14.1               | 0.4                    | 1.1                    | 1.4                    | ab                  |
| Filterer FFG (% of community)           | ANOVA                         | none                | NO                                  | 0.908   | 2007                                         | 4               | 16.7 | 17.1               | -                      | -0.2                   | -0.9                   | a                   |
|                                         |                               |                     |                                     |         | 2008                                         | 4               | 19.9 | 17.1               | 0.2                    | -                      | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2013                                         | 3               | 21.0 | 4.7                | 0.3                    | 0.1                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 18.6 | 6.8                | 0.1                    | -0.1                   | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 23.0 | 17.3               | 0.4                    | 0.2                    | 0.4                    | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 16.5 | 8.0                | 0.0                    | -0.2                   | -1.0                   | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 17.5 | 15.7               | 0.0                    | -0.1                   | -0.7                   | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 10.0 | 5.8                | -0.4                   | -0.6                   | -2.4                   | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 14.6 | 14.5               | -0.1                   | -0.3                   | -1.4                   | a                   |

 Indicates a significant difference for respective comparison (p-value ≤ 0.1).

 Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.38: Statistical Comparison of Benthic Metrics at Sheardown Lake NW Profundal (Deep) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2013) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2013 |                     |
| Density (No. per m <sup>2</sup> )       | ANOVA                         | log10               | YES                                 | 0.001   | 2007                            | 4               | 1,461 | 308                | -                      | -4.3                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 2,744 | 302                | 4.2                    | -                      | b                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 1,425 | 210                | -0.1                   | -4.4                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 861   | 391                | -1.9                   | -6.2                   | c                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 1,154 | 240                | -1.0                   | -5.3                   | a,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 1,670 | 302                | 0.7                    | -3.6                   | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 1,326 | 527                | -0.4                   | -4.7                   | a,c                 |
| Richness (No. of Taxa)                  | ANOVA                         | none                | NO                                  | 0.898   | 2007                            | 4               | 7.5   | 0.4                | -                      | -0.9                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 9.8   | 2.5                | 5.4                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 8.4   | 3.0                | 2.1                    | -0.6                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 9.2   | 3.5                | 4.0                    | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 9.4   | 3.5                | 4.4                    | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 9.2   | 3.5                | 4.0                    | -0.3                   | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 7.8   | 2.5                | 0.7                    | -0.8                   | a                   |
| Simpson's Evenness                      | ANOVA                         | none                | NO                                  | 0.228   | 2007                            | 4               | 0.426 | 0.165              | -                      | -0.6                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 0.521 | 0.167              | 0.6                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.355 | 0.212              | -0.4                   | -1.0                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.717 | 0.113              | 1.8                    | 1.2                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.491 | 0.133              | 0.4                    | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.444 | 0.210              | 0.1                    | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.486 | 0.295              | 0.4                    | -0.2                   | a                   |
| Nemata (% of community)                 | K-W                           | rank                | YES                                 | 0.058   | 2007                            | 4               | 0.6   | 0.5                | -                      | -1.2                   | a,b                 |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 3.6   | 2.6                | 5.8                    | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.5   | 0.3                | -0.2                   | -1.2                   | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 1.4   | 3.0                | 1.4                    | -0.9                   | b,c                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.6   | 1.0                | -0.1                   | -1.2                   | b,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.4   | 0.4                | -0.4                   | -1.2                   | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.0   | 0.0                | -1.2                   | -1.4                   | c                   |
| Ostracoda (% of community)              | ANOVA                         | log10(x+1)          | NO                                  | 0.137   | 2007                            | 4               | 0.3   | 0.4                | -                      | -0.7                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 6.2   | 8.7                | 16.4                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 2.8   | 3.7                | 7.0                    | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 6.8   | 4.6                | 18.2                   | 0.1                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 2.9   | 2.4                | 7.1                    | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 2.5   | 1.6                | 6.3                    | -0.4                   | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 6.6   | 3.9                | 17.5                   | 0.0                    | a                   |
| Chironomidae (% of community)           | ANOVA                         | log10               | NO                                  | 0.124   | 2007                            | 4               | 94.6  | 1.9                | -                      | 1.1                    | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 84.9  | 8.8                | -5.0                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 93.2  | 6.0                | -0.7                   | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 85.1  | 8.5                | -4.9                   | 0.0                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 90.4  | 3.8                | -2.2                   | 0.6                    | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 93.0  | 5.7                | -0.8                   | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 90.8  | 3.7                | -2.0                   | 0.7                    | a                   |
| Metal Sensitive Taxa (% of community)   | K-W                           | rank                | YES                                 | 0.041   | 2007                            | 4               | 0.5   | 0.6                | -                      | -0.5                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 1.4   | 1.7                | 1.4                    | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 2.8   | 2.8                | 3.7                    | 0.9                    | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 6.3   | 4.4                | 9.2                    | 2.9                    | c                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 3.3   | 2.0                | 4.4                    | 1.1                    | b,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 2.2   | 2.1                | 2.7                    | 0.5                    | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 4.0   | 4.0                | 5.6                    | 1.6                    | b,c                 |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.011   | 2007                            | 4               | 83.6  | 8.4                | -                      | -0.6                   | a,b                 |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 86.4  | 4.8                | 0.3                    | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 90.5  | 5.3                | 0.8                    | 0.9                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 75.5  | 7.3                | -1.0                   | -2.3                   | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 85.2  | 7.7                | 0.2                    | -0.3                   | a,b                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 88.6  | 6.5                | 0.6                    | 0.5                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 91.9  | 3.5                | 1.0                    | 1.2                    | a                   |
| Filterer FFG (% of community)           | K-W                           | rank                | NO                                  | 0.575   | 2007                            | 4               | 0.1   | 0.1                | -                      | -0.8                   | a                   |
|                                         |                               |                     |                                     |         | 2013                            | 5               | 1.3   | 1.6                | 11.6                   | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 1.9   | 2.6                | 16.7                   | 0.3                    | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 2.9   | 2.5                | 26.2                   | 1.0                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 1.0   | 1.4                | 8.5                    | -0.2                   | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 1.3   | 2.6                | 11.1                   | 0.0                    | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 2.4   | 4.9                | 21.8                   | 0.7                    | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.39: Statistical Comparison of Sediment Physical Properties Between Sheardown Lake SE (DL0-2) and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results      |                     |                                       |         | Summary Statistics |                   |      |                    |                |         |         |
|-----------------------------|----------------------------------------|-------------------------------|---------------------|---------------------------------------|---------|--------------------|-------------------|------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference between Areas? | P-value | Study Lake         | Sample Size ( n ) | Mean | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                        | none                | YES                                   | 0.003   | Reference          | 5                 | 29.6 | 7.5                | 3.4            | 23.4    | 40.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 11.1 | 6.7                | 3.0            | 5.2     | 21.6    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | YES                                   | 0.009   | Reference          | 5                 | 62.2 | 6.3                | 2.8            | 53.4    | 68.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 75.0 | 5.5                | 2.5            | 68.9    | 81.5    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | YES                                   | 0.029   | Reference          | 5                 | 8.2  | 3.0                | 1.3            | 6.2     | 13.4    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 13.9 | 3.7                | 1.7            | 9.4     | 17.5    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.000   | Reference          | 5                 | 87.9 | 4.6                | 2.1            | 80.2    | 92.3    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 60.9 | 7.3                | 3.3            | 48.9    | 68.6    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.008   | Reference          | 5                 | 4.8  | 2.0                | 0.9            | 2.3     | 7.0     |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 1.4  | 0.8                | 0.4            | 0.4     | 2.3     |
| Profundal (Deep) Stations   | Station Depth (m)                      | tequal                        | log10               | YES                                   | 0.001   | Reference          | 5                 | 20.6 | 2.2                | 1.0            | 18.5    | 24.2    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 12.4 | 1.2                | 0.5            | 10.5    | 13.5    |
|                             | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.146   | Reference          | 5                 | 31.6 | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 15.1 | 5.3                | 2.4            | 8.3     | 20.7    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.112   | Reference          | 5                 | 57.4 | 18.1               | 8.1            | 36.9    | 71.9    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 72.2 | 4.0                | 1.8            | 67.5    | 76.6    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.477   | Reference          | 5                 | 11.0 | 4.3                | 1.9            | 6.3     | 15.1    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 12.7 | 2.8                | 1.2            | 9.5     | 15.6    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.001   | Reference          | 5                 | 82.6 | 3.6                | 1.6            | 78.3    | 86.6    |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 55.8 | 11.8               | 5.3            | 41.9    | 70.7    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.002   | Reference          | 5                 | 3.4  | 1.1                | 0.5            | 2.2     | 4.5     |
|                             |                                        |                               |                     |                                       |         | Sheardown SE       | 5                 | 1.1  | 0.6                | 0.2            | 0.2     | 1.6     |

Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).

**Table F.40: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Southeast, August 2020**

| Taxa                      | Study Area        | Sheardown Lake SE - Littoral Stations |          |         |         |         |
|---------------------------|-------------------|---------------------------------------|----------|---------|---------|---------|
|                           | Replicate Station | DLO-2-11                              | DLO-2-10 | DLO-2-4 | DLO-2-9 | DLO-2-1 |
| <b>ROUNDWORMS</b>         |                   |                                       |          |         |         |         |
| P. Nemata                 |                   | -                                     | -        | 103     | 9       | -       |
| <b><u>ANNELIDS</u></b>    |                   |                                       |          |         |         |         |
| P. Annelida               |                   |                                       |          |         |         |         |
| <b>WORMS</b>              |                   |                                       |          |         |         |         |
| Cl. Oligochaeta           |                   |                                       |          |         |         |         |
| F. Enchytraeidae          |                   | -                                     | -        | -       | -       | -       |
| F. Lumbriculidae          |                   |                                       |          |         |         |         |
| <i>Lumbriculus</i>        |                   | -                                     | -        | -       | -       | -       |
| <b><u>ARTHROPODS</u></b>  |                   |                                       |          |         |         |         |
| P. Arthropoda             |                   |                                       |          |         |         |         |
| <b>MITES</b>              |                   |                                       |          |         |         |         |
| Cl. Arachnida             |                   |                                       |          |         |         |         |
| O. Acarina                |                   |                                       |          |         |         |         |
| immature                  |                   | -                                     | -        | -       | -       | -       |
| F. Acalyptonotidae        |                   |                                       |          |         |         |         |
| <i>Acalyptonotus</i>      |                   | 34                                    | 34       | 34      | 43      | 17      |
| F. Hygrobatidae           |                   |                                       |          |         |         |         |
| <i>Hygrobates</i>         |                   | 34                                    | 17       | 259     | 69      | 129     |
| F. Lebertiidae            |                   |                                       |          |         |         |         |
| <i>Lebertia</i>           |                   | -                                     | 17       | 69      | 34      | 43      |
| F. Sperchontidae          |                   |                                       |          |         |         |         |
| <i>Sperchon</i>           |                   | -                                     | -        | -       | -       | -       |
| <b>HARPACTICOIDS</b>      |                   |                                       |          |         |         |         |
| O. Harpacticoida          |                   | -                                     | -        | -       | -       | -       |
| <b>SEED SHRIMPS</b>       |                   |                                       |          |         |         |         |
| Cl. Ostracoda             |                   | 121                                   | 638      | 638     | 448     | 129     |
| <b><u>INSECTS</u></b>     |                   |                                       |          |         |         |         |
| Cl. Insecta               |                   |                                       |          |         |         |         |
| <b>CADDISFLIES</b>        |                   |                                       |          |         |         |         |
| O. Trichoptera            |                   |                                       |          |         |         |         |
| F. Apataniidae            |                   |                                       |          |         |         |         |
| <i>Apatania</i>           |                   | -                                     | 69       | 17      | -       | -       |
| F. Limnephilidae          |                   |                                       |          |         |         |         |
| <i>Grensia praeterita</i> |                   | -                                     | -        | -       | -       | -       |
| <b><u>TRUE FLIES</u></b>  |                   |                                       |          |         |         |         |
| O. Diptera                |                   |                                       |          |         |         |         |
| <b>MIDGES</b>             |                   |                                       |          |         |         |         |
| F. Chironomidae           |                   |                                       |          |         |         |         |
| chironomid pupae          |                   | -                                     | -        | -       | 17      | 112     |
| S.F. Chironominae         |                   |                                       |          |         |         |         |
| <i>Chironomus</i>         |                   | -                                     | -        | -       | -       | 543     |
| <i>Micropsectra</i>       |                   | 293                                   | 86       | 86      | 310     | -       |

**Table F.40: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Southeast, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Lake SE - Littoral Stations |          |         |         |         |
|----------------------------------------------------|---------------------------------|---------------------------------------|----------|---------|---------|---------|
|                                                    |                                 | DLO-2-11                              | DLO-2-10 | DLO-2-4 | DLO-2-9 | DLO-2-1 |
| <i>Paratanytarsus</i>                              |                                 | -                                     | 17       | -       | -       | 60      |
| <i>Sergentia</i>                                   |                                 | -                                     | -        | -       | 17      | -       |
| <i>Stictochironomus</i>                            |                                 | 1,603                                 | 3,655    | 2,293   | 905     | 543     |
| <i>Tanytarsus</i>                                  |                                 | 724                                   | 103      | 448     | 517     | 405     |
| <b>S.F. Diamesinae</b>                             |                                 |                                       |          |         |         |         |
| <i>Diamesa</i>                                     |                                 | -                                     | -        | -       | -       | -       |
| <i>Protanypus</i>                                  |                                 | -                                     | -        | -       | -       | -       |
| <i>Pseudodiamesa</i>                               |                                 | -                                     | -        | -       | -       | -       |
| <b>S.F. Orthoclaadiinae</b>                        |                                 |                                       |          |         |         |         |
| <i>Abiskomyia</i>                                  |                                 | 121                                   | 534      | 655     | 664     | 276     |
| <i>Heterotrissocladius</i>                         |                                 | 293                                   | 362      | 181     | 172     | 78      |
| <i>Hydrobaenus</i>                                 |                                 | -                                     | -        | -       | -       | -       |
| <i>Mesocricotopus</i>                              |                                 | -                                     | -        | -       | -       | -       |
| <i>Paracladius</i>                                 |                                 | -                                     | -        | -       | -       | -       |
| <i>Parakiefferiella</i>                            |                                 | -                                     | -        | -       | -       | -       |
| <i>Psectrocladius</i>                              |                                 | -                                     | 17       | -       | -       | -       |
| <i>Zalutschia</i>                                  |                                 | -                                     | -        | -       | -       | -       |
| Orthoclaadiinae indeterminate                      |                                 | -                                     | -        | -       | -       | -       |
| <b>S.F. Tanypodinae</b>                            |                                 |                                       |          |         |         |         |
| <i>Arctopelopia</i>                                |                                 | 17                                    | 121      | 60      | 9       | -       |
| <i>Procladius</i>                                  |                                 | 1,966                                 | 1,241    | 1,345   | 2,293   | 879     |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 3,216                                 | 5,207    | 6,914   | 6,190   | 5,509   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 11                                    | 10       | 14      | 13      | 13      |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.911                                 | 0.818    | 0.722   | 0.851   | 0.827   |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.834                                 | 2.292    | 2.219   | 2.692   | 2.565   |
| <b>Dominant Taxonomic Group Composition</b>        |                                 |                                       |          |         |         |         |
| % Nemata                                           |                                 | 0.0                                   | 0.0      | 0.0     | 1.7     | 0.2     |
| % Hydracarina                                      |                                 | 5.9                                   | 1.3      | 1.0     | 5.8     | 2.7     |
| % Ostracods                                        |                                 | 4.0                                   | 2.3      | 9.2     | 10.3    | 8.1     |
| % Chironomids                                      |                                 | 90.1                                  | 96.4     | 88.8    | 81.9    | 89.0    |
| % Metal Sensitive Chironomids                      |                                 | 15.1                                  | 19.5     | 3.0     | 8.6     | 15.1    |
| <b>Functional Feeding Group Composition</b>        |                                 |                                       |          |         |         |         |
| % Collector - Gatherers                            |                                 | 50.6                                  | 41.1     | 75.3    | 62.5    | 40.3    |
| % Filterers                                        |                                 | 15.1                                  | 19.5     | 3.0     | 8.6     | 15.1    |
| % Shredders                                        |                                 | 0.0                                   | 0.0      | 0.0     | 0.0     | 0.0     |
| <b>Habit Preference Group Composition</b>          |                                 |                                       |          |         |         |         |
| % Clingers                                         |                                 | 19.0                                  | 20.9     | 4.7     | 14.8    | 18.1    |
| % Sprawlers                                        |                                 | 45.9                                  | 48.3     | 42.4    | 46.5    | 65.3    |
| % Burrowers                                        |                                 | 35.1                                  | 30.8     | 52.9    | 38.7    | 16.6    |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.40: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Southeast, August 2020**

| Taxa                     | Study Area        | Sheardown Lake SE - Profundal Stations |         |          |         |         |
|--------------------------|-------------------|----------------------------------------|---------|----------|---------|---------|
|                          | Replicate Station | DLO-2-12                               | DLO-2-8 | DLO-2-13 | DLO-2-2 | DLO-2-3 |
| <b>ROUNDWORMS</b>        |                   |                                        |         |          |         |         |
| P. Nemata                |                   | -                                      | -       | -        | -       | -       |
| <b><u>ANNELIDS</u></b>   |                   |                                        |         |          |         |         |
| P. Annelida              |                   |                                        |         |          |         |         |
| <b>WORMS</b>             |                   |                                        |         |          |         |         |
| Cl. Oligochaeta          |                   |                                        |         |          |         |         |
| F. Enchytraeidae         |                   | -                                      | -       | -        | -       | -       |
| F. Lumbriculidae         |                   |                                        |         |          |         |         |
| Lumbriculus              |                   | -                                      | -       | -        | -       | -       |
| <b><u>ARTHROPODS</u></b> |                   |                                        |         |          |         |         |
| P. Arthropoda            |                   |                                        |         |          |         |         |
| <b>MITES</b>             |                   |                                        |         |          |         |         |
| Cl. Arachnida            |                   |                                        |         |          |         |         |
| O. Acarina               |                   |                                        |         |          |         |         |
| immature                 |                   | -                                      | -       | -        | -       | -       |
| F. Acalyptonotidae       |                   |                                        |         |          |         |         |
| Acalyptonotus            |                   | 9                                      | 17      | 17       | 9       | 9       |
| F. Hygrobatidae          |                   |                                        |         |          |         |         |
| Hygrobates               |                   | 9                                      | 17      | 9        | 26      | -       |
| F. Lebertiidae           |                   |                                        |         |          |         |         |
| Lebertia                 |                   | 9                                      | -       | -        | 9       | 17      |
| F. Sperchontidae         |                   |                                        |         |          |         |         |
| Sperchon                 |                   | -                                      | -       | -        | -       | -       |
| <b>HARPACTICOIDS</b>     |                   |                                        |         |          |         |         |
| O. Harpacticoida         |                   | -                                      | -       | -        | -       | -       |
| <b>SEED SHRIMPS</b>      |                   |                                        |         |          |         |         |
| Cl. Ostracoda            |                   | 69                                     | 190     | 9        | 78      | 121     |
| <b><u>INSECTS</u></b>    |                   |                                        |         |          |         |         |
| Cl. Insecta              |                   |                                        |         |          |         |         |
| <b>CADDISFLIES</b>       |                   |                                        |         |          |         |         |
| O. Trichoptera           |                   |                                        |         |          |         |         |
| F. Apataniidae           |                   |                                        |         |          |         |         |
| Apatania                 |                   | -                                      | -       | -        | -       | -       |
| F. Limnephilidae         |                   |                                        |         |          |         |         |
| Grensia praeterita       |                   | -                                      | -       | -        | -       | -       |
| <b><u>TRUE FLIES</u></b> |                   |                                        |         |          |         |         |
| O. Diptera               |                   |                                        |         |          |         |         |
| <b>MIDGES</b>            |                   |                                        |         |          |         |         |
| F. Chironomidae          |                   |                                        |         |          |         |         |
| chironomid pupae         |                   | -                                      | 52      | -        | -       | 9       |
| S.F. Chironominae        |                   |                                        |         |          |         |         |
| Chironomus               |                   | 112                                    | 862     | -        | -       | -       |
| Micropsectra             |                   | 9                                      | -       | -        | -       | -       |



**Table F.40: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Sheardown Lake Southeast, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | Sheardown Lake SE - Profundal Stations |         |          |         |         |
|----------------------------------------------------|---------------------------------|----------------------------------------|---------|----------|---------|---------|
|                                                    |                                 | DLO-2-12                               | DLO-2-8 | DLO-2-13 | DLO-2-2 | DLO-2-3 |
| <i>Paratanytarsus</i>                              |                                 | -                                      | 17      | -        | -       | -       |
| <i>Sergentia</i>                                   |                                 | 17                                     | -       | -        | -       | -       |
| <i>Stictochironomus</i>                            |                                 | 259                                    | 259     | -        | -       | -       |
| <i>Tanytarsus</i>                                  |                                 | -                                      | 155     | -        | -       | -       |
| <b>S.F. Diamesinae</b>                             |                                 |                                        |         |          |         |         |
| <i>Diamesa</i>                                     |                                 | -                                      | -       | -        | -       | -       |
| <i>Protanypus</i>                                  |                                 | 17                                     | -       | 17       | 34      | 26      |
| <i>Pseudodiamesa</i>                               |                                 | -                                      | -       | -        | -       | -       |
| <b>S.F. Orthoclaadiinae</b>                        |                                 |                                        |         |          |         |         |
| <i>Abiskomyia</i>                                  |                                 | 69                                     | 52      | -        | -       | -       |
| <i>Heterotrissocladius</i>                         |                                 | 216                                    | -       | 707      | 1,138   | 1,810   |
| <i>Hydrobaenus</i>                                 |                                 | -                                      | -       | -        | -       | -       |
| <i>Mesocricotopus</i>                              |                                 | -                                      | -       | -        | -       | -       |
| <i>Paracladius</i>                                 |                                 | -                                      | -       | -        | -       | -       |
| <i>Parakiefferiella</i>                            |                                 | -                                      | -       | -        | -       | -       |
| <i>Psectrocladius</i>                              |                                 | -                                      | -       | -        | -       | -       |
| <i>Zalutschia</i>                                  |                                 | -                                      | -       | -        | -       | -       |
| Orthoclaadiinae indeterminate                      |                                 | -                                      | -       | -        | -       | -       |
| <b>S.F. Tanypodinae</b>                            |                                 |                                        |         |          |         |         |
| <i>Arctopelopia</i>                                |                                 | -                                      | -       | -        | -       | -       |
| <i>Procladius</i>                                  |                                 | 34                                     | -       | 43       | 52      | 43      |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 3,350                                  | 3,038   | 6,189    | 3,177   | 3,670   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 13                                     | 15      | 12       | 6       | 11      |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.835                                  | 0.806   | 0.869    | 0.732   | 0.619   |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.566                                  | 2.596   | 2.670    | 1.665   | 1.736   |
| <b>Dominant Taxonomic Group Composition</b>        |                                 |                                        |         |          |         |         |
| % Nemata                                           |                                 | 0.3                                    | 0.0     | 0.4      | 0.0     | 0.2     |
| % Hydracarina                                      |                                 | 3.1                                    | 2.8     | 2.5      | 0.3     | 0.9     |
| % Ostracods                                        |                                 | 6.5                                    | 5.7     | 13.0     | 0.8     | 0.5     |
| % Chironomids                                      |                                 | 90.2                                   | 91.2    | 84.1     | 98.9    | 98.3    |
| % Metal Sensitive Chironomids                      |                                 | 24.0                                   | 21.6    | 19.9     | 22.0    | 11.8    |
| <b>Functional Feeding Group Composition</b>        |                                 |                                        |         |          |         |         |
| % Collector - Gatherers                            |                                 | 33.6                                   | 52.1    | 44.3     | 61.8    | 70.6    |
| % Filterers                                        |                                 | 23.8                                   | 21.6    | 19.2     | 22.0    | 11.8    |
| % Shredders                                        |                                 | 0.3                                    | 0.6     | 0.0      | 0.0     | 0.0     |
| <b>Habit Preference Group Composition</b>          |                                 |                                        |         |          |         |         |
| % Clingers                                         |                                 | 26.9                                   | 19.6    | 21.7     | 22.3    | 12.3    |
| % Sprawlers                                        |                                 | 53.7                                   | 37.4    | 55.1     | 16.8    | 21.3    |
| % Burrowers                                        |                                 | 19.4                                   | 43.0    | 23.2     | 61.0    | 66.4    |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.41: Statistical Comparison of Benthic Invertebrate Community Metrics at Sheardown Lake SE Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2013) for the Mary River Project CREMP**

| Metric                                | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |        |                    |                                    |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|--------|--------------------|------------------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean   | Standard Deviation | Effect Size vs. Baseline Year 2013 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | none                | YES                                 | <0.001  | 2013                                         | 4               | 10,649 | 4,062              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 4,829  | 1,898              | -1.4                               | b                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 3,700  | 1,485              | -1.7                               | b                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 4,417  | 1,317              | -1.5                               | b                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 4,240  | 1,520              | -1.6                               | b                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 5,080  | 1,329              | -1.4                               | b                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 5,407  | 1,391              | -1.3                               | b                   |
| Richness (No. of Taxa)                | ANOVA                         | log10               | YES                                 | 0.052   | 2013                                         | 4               | 14.2   | 4.0                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 10.6   | 2.5                | -0.9                               | a,b                 |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 11.4   | 2.3                | -0.7                               | a,b                 |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 9.0    | 0.7                | -1.3                               | b                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 10.2   | 2.6                | -1.0                               | a,b                 |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 11.6   | 0.9                | -0.7                               | a,b                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 12.2   | 1.6                | -0.5                               | a,b                 |
| Simpson's Evenness                    | ANOVA                         | log10               | NO                                  | 0.219   | 2013                                         | 4               | 0.785  | 0.096              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 0.759  | 0.123              | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 0.772  | 0.089              | -0.1                               | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 0.712  | 0.055              | -0.8                               | a                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 0.704  | 0.131              | -0.8                               | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 0.826  | 0.058              | 0.4                                | a                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 0.826  | 0.068              | 0.4                                | a                   |
| Nemata (% of community)               | K-W                           | rank                | NO                                  | 0.905   | 2013                                         | 4               | 0.2    | 0.2                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 1.5    | 2.9                | 7.0                                | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 1.1    | 1.3                | 4.4                                | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 0.5    | 0.6                | 1.4                                | a                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 0.6    | 0.5                | 1.8                                | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 1.1    | 1.3                | 4.5                                | a                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 0.4    | 0.7                | 0.8                                | a                   |
| Ostracoda (% of community)            | K-W                           | rank                | NO                                  | 0.274   | 2013                                         | 4               | 5.9    | 8.8                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 5.5    | 10.0               | 0.0                                | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 1.7    | 2.5                | -0.5                               | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 0.8    | 0.8                | -0.6                               | a                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 6.1    | 9.9                | 0.0                                | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 5.4    | 7.7                | -0.1                               | a                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 6.8    | 3.5                | 0.1                                | a                   |
| Chironomidae (% of community)         | K-W                           | rank                | NO                                  | 0.132   | 2013                                         | 4               | 89.9   | 7.5                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 88.9   | 9.4                | -0.1                               | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 95.4   | 3.9                | 0.7                                | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 95.6   | 1.8                | 0.8                                | a                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 92.4   | 10.0               | 0.3                                | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 90.3   | 9.2                | 0.0                                | a                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 89.2   | 5.1                | -0.1                               | a                   |
| Metal Sensitive Taxa (% of community) | ANOVA                         | none                | NO                                  | 0.615   | 2013                                         | 4               | 15.1   | 9.8                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 12.7   | 10.4               | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 6.8    | 4.2                | -0.8                               | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 12.1   | 4.2                | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 12.1   | 8.9                | -0.3                               | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 16.3   | 7.8                | 0.1                                | a                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 12.3   | 6.5                | -0.3                               | a                   |

**Table F.41: Statistical Comparison of Benthic Invertebrate Community Metrics at Sheardown Lake SE Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2013) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2013 | Pairwise Comparison |
| Collector-Gatherer FFG (% of community) | ANOVA                         | log10               | NO                                  | 0.605   | 2013                                         | 4               | 44.6 | 8.2                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 59.1 | 10.6               | 1.8                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 56.5 | 12.8               | 1.5                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 48.4 | 18.8               | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 52.5 | 11.1               | 1.0                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 51.9 | 14.6               | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 54.0 | 14.9               | 1.1                                | a                   |
| Filterer FFG (% of community)           | ANOVA                         | none                | NO                                  | 0.598   | 2013                                         | 4               | 15.1 | 9.8                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 12.5 | 10.4               | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 6.7  | 4.4                | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 12.1 | 4.2                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 12.1 | 8.9                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 16.3 | 7.8                | 0.1                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 12.3 | 6.5                | -0.3                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.42: Statistical Comparison of Benthic Metrics at Sheardown Lake SE Profundal (Deep) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2013) for the Mary River Project CREMP**

| Metric                                     | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|--------------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                            | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                            |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2013 |                     |
| Density<br>(No. per m <sup>2</sup> )       | K-W                           | rank                | YES                                 | 0.020   | 2007                            | 3               | 4,998 | 348                | -                      | -1.8                   | a,b                 |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 6,602 | 874                | 4.6                    | -                      | a                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 3,185 | 281                | -5.2                   | -3.9                   | c                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 3,234 | 880                | -5.1                   | -3.9                   | b,c,d               |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 3,209 | 2,747              | -5.1                   | -3.9                   | c,d                 |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 4,284 | 851                | -2.1                   | -2.7                   | a,b,d               |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 3,869 | 1,304              | -3.2                   | -3.1                   | b,c,d               |
| Richness<br>(No. of Taxa)                  | ANOVA                         | none                | NO                                  | 0.395   | 2007                            | 3               | 9.0   | 2.8                | -                      | -0.7                   | a                   |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 10.5  | 2.1                | 0.5                    | -                      | a                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 8.8   | 1.8                | -0.1                   | -0.8                   | a                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 8.8   | 1.6                | -0.1                   | -0.8                   | a                   |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 8.4   | 2.2                | -0.2                   | -1.0                   | a                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 10.2  | 2.3                | 0.4                    | -0.1                   | a                   |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 11.4  | 3.4                | 0.9                    | 0.4                    | a                   |
| Simpson's Evenness                         | K-W                           | rank                | YES                                 | 0.045   | 2007                            | 3               | 0.607 | 0.093              | -                      | -2.4                   | a,b                 |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 0.703 | 0.039              | 1.0                    | -                      | a,c                 |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 0.588 | 0.130              | -0.2                   | -2.9                   | a,b                 |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 0.651 | 0.086              | 0.5                    | -1.3                   | a,b                 |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 0.568 | 0.050              | -0.4                   | -3.4                   | b                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 0.706 | 0.149              | 1.1                    | 0.1                    | a,c                 |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 0.772 | 0.099              | 1.8                    | 1.8                    | c                   |
| Nemata<br>(% of community)                 | K-W                           | rank                | NO                                  | 0.509   | 2007                            | 3               | 0.0   | 0.1                | -                      | -0.9                   | a                   |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 0.1   | 0.1                | 1.6                    | -                      | a                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 0.6   | 1.1                | 11.4                   | 5.4                    | a                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 0.0   | 0.0                | -0.6                   | -1.2                   | a                   |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 0.9   | 1.7                | 16.4                   | 8.2                    | a                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 0.3   | 0.3                | 4.8                    | 1.8                    | a                   |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 0.2   | 0.2                | 2.9                    | 0.7                    | a                   |
| Ostracoda<br>(% of community)              | K-W                           | rank                | YES                                 | 0.033   | 2007                            | 3               | 1.1   | 1.5                | -                      | 5.1                    | a,b                 |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 0.2   | 0.2                | -0.7                   | -                      | b                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 0.5   | 0.4                | -0.4                   | 1.8                    | b                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 1.0   | 1.4                | -0.1                   | 4.5                    | b                   |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 0.8   | 1.3                | -0.2                   | 3.3                    | b                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 2.2   | 1.7                | 0.7                    | 10.4                   | a                   |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 5.3   | 5.1                | 2.8                    | 26.7                   | a                   |
| Chironomidae<br>(% of community)           | K-W                           | rank                | NO                                  | 0.364   | 2007                            | 3               | 97.0  | 2.9                | -                      | -5.6                   | a                   |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 98.6  | 0.3                | 0.6                    | -                      | a                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 97.0  | 2.9                | 0.0                    | -5.5                   | a                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 97.1  | 1.6                | 0.0                    | -5.3                   | a                   |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 97.6  | 2.1                | 0.2                    | -3.7                   | a                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 95.3  | 4.2                | -0.6                   | -11.5                  | a                   |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 92.5  | 6.2                | -1.6                   | -21.1                  | a                   |
| Metal Sensitive Taxa<br>(% of community)   | ANOVA                         | none                | YES                                 | 0.065   | 2007                            | 3               | 13.5  | 11.4               | -                      | -1.2                   | a,b                 |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 16.8  | 2.8                | 0.3                    | -                      | a,b                 |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 8.0   | 4.7                | -0.5                   | -3.2                   | a,b                 |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 12.3  | 9.5                | -0.1                   | -1.6                   | a,b                 |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 5.9   | 3.5                | -0.7                   | -3.9                   | b                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 16.9  | 10.9               | 0.3                    | 0.0                    | a,b                 |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 19.9  | 4.7                | 0.6                    | 1.1                    | a                   |
| Collector-Gatherer FFG<br>(% of community) | ANOVA                         | none                | NO                                  | 0.459   | 2007                            | 3               | 74.1  | 15.7               | -                      | 1.2                    | a                   |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 64.9  | 7.5                | -0.6                   | -                      | a                   |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 60.2  | 23.0               | -0.9                   | -0.6                   | a                   |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 45.1  | 17.4               | -1.8                   | -2.6                   | a                   |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 63.8  | 22.4               | -0.7                   | -0.1                   | a                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 52.7  | 26.8               | -1.4                   | -1.6                   | a                   |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 52.5  | 14.5               | -1.4                   | -1.7                   | a                   |
| Filterer FFG<br>(% of community)           | ANOVA                         | log10               | YES                                 | 0.042   | 2007                            | 3               | 13.4  | 11.5               | -                      | -1.2                   | a,b                 |
|                                            |                               |                     |                                     |         | 2013                            | 4               | 16.8  | 2.8                | 0.3                    | -                      | a,b                 |
|                                            |                               |                     |                                     |         | 2015                            | 5               | 7.8   | 4.7                | -0.5                   | -3.2                   | a,b                 |
|                                            |                               |                     |                                     |         | 2017                            | 5               | 12.2  | 9.6                | -0.1                   | -1.6                   | a,b                 |
|                                            |                               |                     |                                     |         | 2018                            | 5               | 5.9   | 3.5                | -0.7                   | -3.9                   | b                   |
|                                            |                               |                     |                                     |         | 2019                            | 5               | 16.8  | 10.9               | 0.3                    | 0.0                    | a,b                 |
|                                            |                               |                     |                                     |         | 2020                            | 5               | 19.7  | 4.7                | 0.5                    | 1.0                    | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.43:** Replicate Grab Data for Benthic Invertebrate Community Samples Collected at the Mary River, Mary River Project CREMP, August 2020

| Study Area                                                      | Station  | Water Depth (cm) |                  |                  | Water Velocity (m/s) |                  |                  | Embeddedness     |                  |                  | In-Stream Vegetation |                  |                  | Algae Presence   |                  |                  |
|-----------------------------------------------------------------|----------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|----------------------|------------------|------------------|------------------|------------------|------------------|
|                                                                 |          | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1     | Replicate Grab 2 | Replicate Grab 3 | Replicate Grab 1 | Replicate Grab 2 | Replicate Grab 3 |
| Mary River<br><br>Upstream Reference (GO-09)<br><br>(Reference) | GO-09 B1 | 8                | 11               | 16               | 0.31                 | 0.32             | 0.47             | 50%              | 50%              | 50%              | none                 | none             | none             | common           | common           | common           |
|                                                                 | GO-09 B2 | 11               | 15               | 6                | 0.33                 | 0.45             | 0.31             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | common           | common           |
|                                                                 | GO-09 B3 | 17               | 9                | 7                | 0.32                 | 0.34             | 0.31             | 50%              | 50%              | 50%              | common               | sparse           | none             | common           | common           | common           |
|                                                                 | GO-09 B4 | 11               | 10               | 6                | 0.31                 | 0.32             | 0.35             | 25%              | 50%              | 50%              | common               | common           | common           | common           | common           | common           |
|                                                                 | GO-09 B5 | 15               | 16               | 8                | 0.31                 | 0.36             | 0.45             | 25%              | 25%              | 25%              | common               | common           | common           | common           | common           | common           |
| Mary River<br><br>Upstream (GO-03)                              | GO-03 B1 | 12               | 6                | 8                | 0.31                 | 0.38             | 0.30             | 25%              | 75%              | 50%              | none                 | none             | none             | common           | common           | common           |
|                                                                 | GO-03 B2 | 8                | 6                | 7                | 0.33                 | 0.45             | 0.37             | 50%              | 50%              | 50%              | sparse               | sparse           | none             | common           | common           | common           |
|                                                                 | GO-03 B3 | 12               | 8                | 6                | 0.46                 | 0.32             | 0.32             | 50%              | 50%              | 50%              | none                 | none             | none             | sparse           | sparse           | sparse           |
|                                                                 | GO-03 B4 | 8                | 10               | 12               | 0.39                 | 0.55             | 0.32             | 50%              | 50%              | 50%              | none                 | sparse           | none             | common           | common           | common           |
|                                                                 | GO-03 B5 | 12               | 16               | 15               | 0.45                 | 0.31             | 0.52             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | sparse           | sparse           |
| Mary River<br><br>Upper Mine-Exposed (EO-01)                    | EO-01 B1 | 12               | 8                | 8                | 0.47                 | 0.40             | 0.32             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | common           | sparse           |
|                                                                 | EO-01 B2 | 12               | 11               | 6                | 0.36                 | 0.46             | 0.36             | 25%              | 25%              | 25%              | sparse               | sparse           | none             | sparse           | sparse           | sparse           |
|                                                                 | EO-01 B3 | 10               | 12               | 20               | 0.53                 | 0.33             | 0.42             | 0%               | 25%              | 0%               | none                 | none             | none             | sparse           | sparse           | common           |
|                                                                 | EO-01 B4 | 17               | 18               | 6                | 0.32                 | 0.32             | 0.30             | 50%              | 50%              | 25%              | none                 | none             | none             | sparse           | common           | sparse           |
|                                                                 | EO-01 B5 | 20               | 10               | 10               | 0.51                 | 0.32             | 0.32             | 75%              | 50%              | 50%              | none                 | none             | none             | sparse           | sparse           | sparse           |
| Mary River<br><br>Middle Mine-Exposed (EO-20)                   | EO-20 B1 | 12               | 14               | 8                | 0.32                 | 0.34             | 0.36             | 25%              | 25%              | 25%              | none                 | none             | none             | sparse           | common           | common           |
|                                                                 | EO-20 B2 | 16               | 10               | 18               | 0.30                 | 0.51             | 0.31             | 25%              | 25%              | 25%              | none                 | none             | none             | common           | sparse           | common           |
|                                                                 | EO-20 B3 | 14               | 20               | 16               | 0.39                 | 0.42             | 0.37             | 50%              | 50%              | 50%              | none                 | none             | none             | sparse           | common           | common           |
|                                                                 | EO-20 B4 | 8                | 11               | 16               | 0.42                 | 0.31             | 0.48             | 25%              | 25%              | 50%              | sparse               | sparse           | none             | sparse           | sparse           | sparse           |
|                                                                 | EO-20 B5 | 12               | 12               | 6                | 0.30                 | 0.42             | 0.42             | 25%              | 25%              | 50%              | sparse               | none             | none             | sparse           | sparse           | sparse           |
| Mary River<br><br>Lower Mine-Exposed (CO-05)                    | CO-05 B1 | 6                | 10               | 8                | 0.30                 | 0.37             | 0.47             | 50%              | 50%              | 50%              | sparse               | none             | sparse           | sparse           | sparse           | sparse           |
|                                                                 | CO-05 B2 | 9                | 12               | 16               | 0.31                 | 0.47             | 0.51             | 25%              | 25%              | 50%              | sparse               | none             | none             | sparse           | sparse           | sparse           |
|                                                                 | CO-05 B3 | 6                | 6                | 7                | 0.31                 | 0.30             | 0.34             | 0%               | 25%              | 50%              | sparse               | none             | common           | sparse           | sparse           | sparse           |
|                                                                 | CO-05 B4 | 8                | 15               | 8                | 0.32                 | 0.31             | 0.31             | 25%              | 25%              | 50%              | sparse               | sparse           | sparse           | sparse           | sparse           | sparse           |
|                                                                 | CO-05 B5 | 6                | 7                | 11               | 0.34                 | 0.31             | 0.42             | 0%               | 25%              | 25%              | sparse               | none             | sparse           | sparse           | sparse           | sparse           |

**Table F.44: Replicate Station Habitat Feature Summary Statistics for Mary River Benthic Stations, Mary River Project CREMP, August 2020**

| <b>Metric</b>                     | <b>Study Area</b>              | <b>Mean</b> | <b>Standard Deviation</b> | <b>Standard Error</b> | <b>Minimum</b> | <b>Median</b> | <b>Maximum</b> |
|-----------------------------------|--------------------------------|-------------|---------------------------|-----------------------|----------------|---------------|----------------|
| <b>Water Depth (cm)</b>           | GO-09 Reference Area           | 11          | 1.5                       | 0.7                   | 9.0            | 11            | 13             |
|                                   | GO-03 Upstream Area            | 9.7         | 2.8                       | 1.2                   | 7.0            | 8.7           | 14             |
|                                   | EO-01 Upper Mine-Exposed Area  | 12          | 2.3                       | 1.0                   | 9.3            | 13            | 14             |
|                                   | EO-20 Middle Mine-Exposed Area | 13          | 2.7                       | 1.2                   | 10             | 12            | 17             |
|                                   | CO-05 Lower Mine-Exposed Area  | 9.0         | 2.3                       | 1.0                   | 6.3            | 8.0           | 12             |
| <b>Water Velocity (m/s)</b>       | GO-09 Reference Area           | 0.35        | 0.024                     | 0.011                 | 0.32           | 0.36          | 0.37           |
|                                   | GO-03 Upstream Area            | 0.39        | 0.040                     | 0.018                 | 0.33           | 0.38          | 0.43           |
|                                   | EO-01 Upper Mine-Exposed Area  | 0.38        | 0.042                     | 0.019                 | 0.31           | 0.39          | 0.43           |
|                                   | EO-20 Middle Mine-Exposed Area | 0.38        | 0.024                     | 0.011                 | 0.34           | 0.38          | 0.40           |
|                                   | CO-05 Lower Mine-Exposed Area  | 0.36        | 0.048                     | 0.022                 | 0.31           | 0.36          | 0.43           |
| <b>Substrate Embeddedness (%)</b> | GO-09 Reference Area           | 0.42        | 0.10                      | 0.046                 | 0.25           | 0.42          | 0.50           |
|                                   | GO-03 Upstream Area            | 0.45        | 0.11                      | 0.050                 | 0.25           | 0.50          | 0.50           |
|                                   | EO-01 Upper Mine-Exposed Area  | 0.32        | 0.19                      | 0.085                 | 0.08           | 0.25          | 0.58           |
|                                   | EO-20 Middle Mine-Exposed Area | 0.33        | 0.10                      | 0.046                 | 0.25           | 0.33          | 0.50           |
|                                   | CO-05 Lower Mine-Exposed Area  | 0.32        | 0.12                      | 0.055                 | 0.17           | 0.33          | 0.50           |

Note: Five stations were sampled at each study area.

**Table F.45: Benthic Station Habitat Feature Statistical Comparisons Among Mary River Reference and Mine-Exposed Study Areas, Mary River Project CREMP, August 2020**

| Metric                     | Overall 5-Area Comparison     |                |                                       |         | Pair-wise, post hoc comparisons |       |                    |                     |
|----------------------------|-------------------------------|----------------|---------------------------------------|---------|---------------------------------|-------|--------------------|---------------------|
|                            | Statistical Test <sup>a</sup> | Transformation | Significant Difference between Areas? | p-value | Study Area                      | Mean  | Standard Deviation | Pairwise Comparison |
| Water Depth (cm)           | ANOVA                         | log10          | YES                                   | 0.079   | G0-09                           | 11.1  | 1.46               | a,b                 |
|                            |                               |                |                                       |         | G0-03                           | 9.73  | 2.78               | a,b                 |
|                            |                               |                |                                       |         | E0-01                           | 12.0  | 2.30               | a,b                 |
|                            |                               |                |                                       |         | E0-20                           | 12.9  | 2.72               | a                   |
|                            |                               |                |                                       |         | C0-05                           | 9.00  | 2.35               | b                   |
| Water Velocity (m/s)       | ANOVA                         | none           | NO                                    | 0.505   | G0-09                           | 0.351 | 0.0237             | a                   |
|                            |                               |                |                                       |         | G0-03                           | 0.385 | 0.0398             | a                   |
|                            |                               |                |                                       |         | E0-01                           | 0.383 | 0.0420             | a                   |
|                            |                               |                |                                       |         | E0-20                           | 0.378 | 0.0242             | a                   |
|                            |                               |                |                                       |         | C0-05                           | 0.359 | 0.0484             | a                   |
| Substrate Embeddedness (%) | ANOVA                         | none           | NO                                    | 0.363   | G0-09                           | 41.7  | 10.2               | a                   |
|                            |                               |                |                                       |         | G0-03                           | 45.0  | 11.2               | a                   |
|                            |                               |                |                                       |         | E0-01                           | 31.7  | 19.0               | a                   |
|                            |                               |                |                                       |         | E0-20                           | 33.3  | 10.2               | a                   |
|                            |                               |                |                                       |         | C0-05                           | 31.7  | 12.4               | a                   |

 Indicates a significant difference for respective comparison (p-values ≤ 0.1).

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.46: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upstream Reference (GO-09) Study Area, August 2020**

| Taxa                    | Study Area        | GO-09 (Upstream Reference) |    |    |     |       |
|-------------------------|-------------------|----------------------------|----|----|-----|-------|
|                         | Replicate Station | B1                         | B2 | B3 | B4  | B5    |
| <hr/>                   |                   |                            |    |    |     |       |
| <hr/>                   |                   |                            |    |    |     |       |
| ROUNDWORMS              |                   |                            |    |    |     |       |
| P. Nemata               |                   | -                          | 4  | -  | 14  | 7     |
| ANNELIDS                |                   |                            |    |    |     |       |
| P. Annelida             |                   |                            |    |    |     |       |
| WORMS                   |                   |                            |    |    |     |       |
| Cl. Oligochaeta         |                   |                            |    |    |     |       |
| F. Enchytraeidae        |                   | -                          | 14 | -  | -   | -     |
| ARTHROPODS              |                   |                            |    |    |     |       |
| P. Arthropoda           |                   |                            |    |    |     |       |
| MITES                   |                   |                            |    |    |     |       |
| Cl. Arachnida           |                   |                            |    |    |     |       |
| O. Acarina              |                   |                            |    |    |     |       |
| F. Sperchonidae         |                   |                            |    |    |     |       |
| Sperchon                |                   | 11                         | -  | -  | 11  | 32    |
| SEED SHRIMPS            |                   |                            |    |    |     |       |
| Cl. Ostracoda           |                   | -                          | -  | -  | -   | -     |
| SPRINGTAILS             |                   |                            |    |    |     |       |
| Cl. Entognatha          |                   |                            |    |    |     |       |
| O. Collembola           |                   | -                          | -  | -  | -   | -     |
| INSECTS                 |                   |                            |    |    |     |       |
| Cl. Insecta             |                   |                            |    |    |     |       |
| MAYFLIES                |                   |                            |    |    |     |       |
| O. Ephemeroptera        |                   |                            |    |    |     |       |
| F. Baetidae             |                   |                            |    |    |     |       |
| Acentrella feropagus    |                   | 25                         | 7  | 11 | 7   | 29    |
| STONEFLIES              |                   |                            |    |    |     |       |
| O. Plecoptera           |                   |                            |    |    |     |       |
| F. Capniidae            |                   |                            |    |    |     |       |
| immature                |                   | -                          | -  | -  | -   | -     |
| TRUE FLIES              |                   |                            |    |    |     |       |
| O. Diptera              |                   |                            |    |    |     |       |
| BITING-MIDGE            |                   |                            |    |    |     |       |
| F. Ceratopogonidae      |                   |                            |    |    |     |       |
| indeterminate           |                   | -                          | -  | -  | -   | -     |
| MIDGES                  |                   |                            |    |    |     |       |
| F. Chironomidae         |                   |                            |    |    |     |       |
| chironomid pupae        |                   | 11                         | 14 | 14 | 14  | 18    |
| S.F. Chironominae       |                   |                            |    |    |     |       |
| Micropsectra            |                   | -                          | -  | -  | -   | -     |
| Stictochironomus        |                   | -                          | -  | -  | -   | -     |
| S.F. Diamesinae         |                   |                            |    |    |     |       |
| Diamesa                 |                   | 36                         | 25 | 4  | 18  | 14    |
| Pseudokiefferiella      |                   | 43                         | 25 | 29 | 484 | 1,487 |
| S.F. Orthocladiinae     |                   |                            |    |    |     |       |
| Cardiocladius           |                   | -                          | 57 | -  | -   | -     |
| Chaetocladius           |                   | -                          | -  | -  | 39  | -     |
| Corynoneura             |                   | -                          | -  | -  | -   | -     |
| Cricotopus              |                   | 11                         | 7  | 54 | 165 | 68    |
| Cricotopus/Orthocladius |                   | 22                         | 22 | 7  | 50  | 29    |
| Diplocladius            |                   | -                          | -  | -  | 4   | -     |
| Eukiefferiella          |                   | -                          | -  | -  | -   | 50    |



**Table F.46: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upstream Reference (GO-09) Study Area, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | GO-09 (Upstream Reference) |       |       |           |           |
|----------------------------------------------------|---------------------------------|----------------------------|-------|-------|-----------|-----------|
|                                                    |                                 | B1                         | B2    | B3    | B4        | B5        |
| <i>Hydrobaenus</i>                                 |                                 | 4                          | -     | 4     | 43        | 7         |
| <i>Hydrosmittia</i>                                |                                 | -                          | -     | -     | 22        | -         |
| <i>Krenosmittia</i>                                |                                 | -                          | 4     | 29    | 18        | 7         |
| <i>Limnophyes</i>                                  |                                 | 4                          | 7     | -     | 25        | -         |
| <i>Metriocnemus</i>                                |                                 | -                          | -     | -     | -         | -         |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | 4                          | 57    | 65    | 86        | 75        |
| <i>Synorthocladius</i>                             |                                 | -                          | -     | -     | -         | -         |
| <i>Tokunagaia</i>                                  |                                 | 90                         | 79    | 39    | 39        | 47        |
| <i>Tvetenia</i>                                    |                                 | 14                         | 11    | 50    | 118       | 82        |
| indeterminate                                      |                                 | <b>43</b>                  | -     | -     | <b>43</b> | <b>50</b> |
| <b>S.F. Tanypodinae</b>                            |                                 |                            |       |       |           |           |
| <i>Thienemannimyia</i> complex                     |                                 | 4                          | -     | -     | -         | -         |
| <b>F. Empididae</b>                                |                                 |                            |       |       |           |           |
| <i>Clinocera</i>                                   |                                 | -                          | -     | -     | -         | -         |
| <b>F. Simuliidae</b>                               |                                 |                            |       |       |           |           |
| <i>Gymnopaia</i>                                   |                                 | 11                         | 4     | 4     | 4         | 75        |
| <i>Metacnephia</i>                                 |                                 | 7                          | 4     | -     | -         | 39        |
| <i>Prosimulium</i>                                 |                                 | -                          | 4     | 4     | -         | 68        |
| <b>F. Tipulidae</b>                                |                                 |                            |       |       |           |           |
| <i>Dicranota</i>                                   |                                 | -                          | -     | -     | -         | -         |
| <i>Ormosia</i>                                     |                                 | -                          | -     | -     | -         | -         |
| <i>Tipula</i>                                      |                                 | 4                          | 7     | 4     | 11        | 22        |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 341                        | 351   | 315   | 1,215     | 2,208     |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 14                         | 16    | 12    | 17        | 16        |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.915                      | 0.903 | 0.923 | 0.829     | 0.562     |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.120                      | 3.160 | 2.940 | 2.840     | 2.020     |
| <b>Dominant Group Composition</b>                  |                                 |                            |       |       |           |           |
| % Nemata                                           |                                 | 0.0                        | 1.0   | 0.0   | 1.2       | 0.3       |
| % Oligochaeta                                      |                                 | 0.0                        | 4.1   | 0.0   | 0.0       | 0.0       |
| % Hydracarina                                      |                                 | 3.2                        | 0.0   | 0.0   | 0.9       | 1.5       |
| % Ephemeroptera                                    |                                 | 7.4                        | 2.0   | 3.4   | 0.6       | 1.3       |
| % Ostracods                                        |                                 | 0.0                        | 0.0   | 0.0   | 0.0       | 0.0       |
| % Chironomids                                      |                                 | 83.2                       | 87.8  | 93.2  | 96.2      | 87.7      |
| % Metal Sensitive Chironomids                      |                                 | 24.1                       | 15.0  | 10.8  | 41.8      | 68.7      |
| % Simuliidae                                       |                                 | 5.3                        | 3.1   | 2.3   | 0.3       | 8.3       |
| % Tipulidae                                        |                                 | 1.1                        | 2.0   | 1.1   | 0.9       | 1.0       |
| <b>Functional Feeding Group Composition</b>        |                                 |                            |       |       |           |           |
| % Collector - Gatherers                            |                                 | 81.2                       | 74.9  | 77.6  | 81.5      | 85.5      |
| % Filterers                                        |                                 | 2.1                        | 2.0   | 1.1   | 0.0       | 4.9       |
| % Shredders                                        |                                 | 9.3                        | 4.9   | 20.1  | 17.4      | 4.7       |
| <b>Habitat Preference Group Composition</b>        |                                 |                            |       |       |           |           |
| % Clingers                                         |                                 | 16.6                       | 5.9   | 21.3  | 17.7      | 13.5      |
| % Sprawlers                                        |                                 | 82.3                       | 69.8  | 77.6  | 80.3      | 85.2      |
| % Burrowers                                        |                                 | 1.1                        | 24.3  | 1.1   | 2.1       | 1.3       |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.47: Statistical Comparison of Benthic Metrics at the Mary River Reference Area (G0-09) Among Years of Mine Operation (2015 to 2020) and Baseline (2006, 2007) for the Mary River Project CREMP**

| Metric                                | Overall 8-Year Comparison     |                      |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|----------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transform-ation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                      |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2006 | vs. Baseline Year 2007 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10                | YES                                 | <0.001  | 2006                            | 3               | 404   | 149                | -                      | -4.0                   | a,b                 |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 739   | 84                 | 2.3                    | -                      | a,c                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 472   | 255                | 0.5                    | -3.2                   | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 662   | 320                | 1.7                    | -0.9                   | a,c                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 410   | 313                | 0.0                    | -3.9                   | a,b                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 194   | 112                | -1.4                   | -6.5                   | b                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 1,623 | 700                | 8.2                    | 10.5                   | c                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 886   | 831                | 3.2                    | 1.8                    | a,c                 |
| Richness (No. of Taxa)                | ANOVA                         | none                 | YES                                 | 0.005   | 2006                            | 3               | 7.3   | 2.9                | -                      | -10.4                  | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 13.3  | 0.6                | 2.1                    | -                      | b                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 11.4  | 3.2                | 1.4                    | -3.3                   | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 14.0  | 1.6                | 2.3                    | 1.2                    | b                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 11.2  | 2.9                | 1.3                    | -3.7                   | a,b                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 11.8  | 2.3                | 1.5                    | -2.7                   | a,b                 |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 11.4  | 1.5                | 1.4                    | -3.3                   | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 15.0  | 2.0                | 2.7                    | 2.9                    | b                   |
| Simpson's Evenness                    | K-W                           | rank                 | YES                                 | 0.001   | 2006                            | 3               | 0.324 | 0.095              | -                      | -8.6                   | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 0.655 | 0.039              | 3.5                    | -                      | a,b                 |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 0.878 | 0.049              | 5.8                    | 5.8                    | c,d                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 0.907 | 0.023              | 6.1                    | 6.5                    | c                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 0.770 | 0.097              | 4.7                    | 3.0                    | b,d                 |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 0.907 | 0.030              | 6.1                    | 6.5                    | c                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.687 | 0.095              | 3.8                    | 0.8                    | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 0.826 | 0.153              | 5.3                    | 4.4                    | c,d                 |
| Nemata (% of community)               | K-W                           | rank                 | NO                                  | 0.6     | 2006                            | 3               | 0.7   | 0.6                | -                      | 0.6                    | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 0.3   | 0.6                | -0.6                   | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 0.4   | 0.5                | -0.5                   | 0.1                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 1.6   | 1.1                | 1.6                    | 2.2                    | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 0.4   | 0.9                | -0.5                   | 0.1                    | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 1.8   | 2.5                | 2.0                    | 2.5                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.6   | 0.5                | -0.1                   | 0.5                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 0.5   | 0.6                | -0.3                   | 0.3                    | a                   |
| Hydracarina (% of community)          | K-W                           | rank                 | YES                                 | 0.003   | 2006                            | 3               | 0.3   | 0.6                | -                      | 0.0                    | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 0.3   | 0.6                | 0.0                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 4.2   | 3.1                | 6.7                    | 6.7                    | b                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 4.6   | 2.3                | 7.4                    | 7.4                    | b                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 0.0   | 0.0                | -0.6                   | -0.6                   | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 0.4   | 0.9                | 0.1                    | 0.1                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.8   | 1.3                | 0.8                    | 0.8                    | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 1.1   | 1.3                | 1.3                    | 1.3                    | a                   |
| Chironomidae (% of community)         | ANOVA                         | none                 | YES                                 | <0.001  | 2006                            | 3               | 98.7  | 0.6                | -                      | 1.2                    | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 97.3  | 1.2                | -2.4                   | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 88.0  | 2.7                | -18.5                  | -8.1                   | a,b                 |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 84.0  | 4.6                | -25.5                  | -11.6                  | b                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 79.2  | 6.5                | -33.8                  | -15.7                  | b                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 78.8  | 12.3               | -34.5                  | -16.1                  | b                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 97.0  | 2.4                | -2.9                   | -0.3                   | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 89.6  | 5.1                | -15.8                  | -6.7                   | a,b                 |
| Metal Sensitive Taxa (% of community) | ANOVA                         | none                 | YES                                 | <0.001  | 2006                            | 3               | 62.0  | 3.5                | -                      | 1.8                    | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 31.0  | 17.6               | -9.0                   | -                      | a,b,c               |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 13.0  | 14.0               | -14.2                  | -1.0                   | c                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 23.2  | 12.3               | -11.2                  | -0.4                   | b,c                 |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 59.8  | 13.1               | -0.6                   | 1.6                    | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 31.0  | 10.6               | -9.0                   | 0.0                    | a,b,c               |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 51.6  | 21.5               | -3.0                   | 1.2                    | a,b                 |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 32.0  | 23.7               | -8.7                   | 0.1                    | a,b,c               |
| Tipulidae (% of community)            | K-W                           | rank                 | NO                                  | 0.16    | 2006                            | 3               | 0.3   | 0.6                | -                      | -0.6                   | a                   |
|                                       |                               |                      |                                     |         | 2007                            | 3               | 1.7   | 2.1                | 2.3                    | -                      | a                   |
|                                       |                               |                      |                                     |         | 2015                            | 5               | 4.4   | 3.0                | 7.0                    | 1.3                    | a                   |
|                                       |                               |                      |                                     |         | 2016                            | 5               | 1.8   | 1.5                | 2.5                    | 0.1                    | a                   |
|                                       |                               |                      |                                     |         | 2017                            | 5               | 1.4   | 1.1                | 1.8                    | -0.1                   | a                   |
|                                       |                               |                      |                                     |         | 2018                            | 5               | 3.2   | 4.1                | 5.0                    | 0.7                    | a                   |
|                                       |                               |                      |                                     |         | 2019                            | 5               | 0.6   | 0.5                | 0.5                    | -0.5                   | a                   |
|                                       |                               |                      |                                     |         | 2020                            | 5               | 1.2   | 0.5                | 1.5                    | -0.2                   | a                   |

**Table F.47: Statistical Comparison of Benthic Metrics at the Mary River Reference Area (G0-09) Among Years of Mine Operation (2015 to 2020) and Baseline (2006, 2007) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2006 | vs. Baseline Year 2007 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | <0.001  | 2006                            | 3               | 98.7 | 1.2                | -                      | 3.5                    | a                   |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 94.7 | 1.2                | -3.5                   | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 78.0 | 12.2               | -18.0                  | -14.5                  | b,c                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 75.4 | 9.0                | -20.3                  | -16.8                  | c                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 74.6 | 6.9                | -21.0                  | -17.5                  | c                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 80.8 | 11.4               | -15.6                  | -12.1                  | b,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 92.6 | 5.0                | -5.3                   | -1.8                   | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 80.2 | 4.1                | -16.1                  | -12.6                  | b,c                 |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | <0.001  | 2006                            | 3               | 0.0  | 0.0                | -                      | not calculable         | a                   |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 0.0  | 0.0                | not calculable         | -                      | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 2.0  | 1.9                | not calculable         | not calculable         | a,b                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 7.2  | 4.2                | not calculable         | not calculable         | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 19.0 | 5.4                | not calculable         | not calculable         | c                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 14.2 | 10.0               | not calculable         | not calculable         | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.0  | 0.0                | not calculable         | not calculable         | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 2.0  | 1.8                | not calculable         | not calculable         | a,b                 |
| Shredder FFG (% of community)           | K-W                           | rank                | YES                                 | 0.014   | 2006                            | 3               | 0.3  | 0.6                | -                      | -6.9                   | a                   |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 4.3  | 0.6                | 6.9                    | -                      | a,b,c               |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 16.0 | 11.3               | 27.2                   | 20.2                   | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 11.8 | 3.6                | 19.9                   | 12.9                   | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 5.6  | 2.3                | 9.1                    | 2.2                    | b,c                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 4.8  | 6.2                | 7.7                    | 0.8                    | a,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 5.0  | 2.8                | 8.1                    | 1.2                    | a,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 11.3 | 7.1                | 19.0                   | 12.1                   | b                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.48: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upstream of the Mine (GO-03) Study Area, August 2020**

| Taxa                    | Study Area        | GO-03 (Upstream of Mine) |    |    |    |    |
|-------------------------|-------------------|--------------------------|----|----|----|----|
|                         | Replicate Station | B1                       | B2 | B3 | B4 | B5 |
| <hr/>                   |                   |                          |    |    |    |    |
| <b>ROUNDWORMS</b>       |                   |                          |    |    |    |    |
| P. Nemata               |                   | 11                       | 7  | -  | -  | 7  |
| <b>ANNELIDS</b>         |                   |                          |    |    |    |    |
| P. Annelida             |                   |                          |    |    |    |    |
| <b>WORMS</b>            |                   |                          |    |    |    |    |
| Cl. Oligochaeta         |                   |                          |    |    |    |    |
| F. Enchytraeidae        |                   | 11                       | -  | -  | 7  | 7  |
| <b>ARTHROPODS</b>       |                   |                          |    |    |    |    |
| P. Arthropoda           |                   |                          |    |    |    |    |
| <b>MITES</b>            |                   |                          |    |    |    |    |
| Cl. Arachnida           |                   |                          |    |    |    |    |
| O. Acarina              |                   |                          |    |    |    |    |
| F. Sperchonidae         |                   |                          |    |    |    |    |
| Sperchon                |                   | 7                        | 7  | 7  | -  | 18 |
| <b>SEED SHRIMPS</b>     |                   |                          |    |    |    |    |
| Cl. Ostracoda           |                   | -                        | -  | -  | -  | -  |
| <b>SPRINGTAILS</b>      |                   |                          |    |    |    |    |
| Cl. Entognatha          |                   |                          |    |    |    |    |
| O. Collembola           |                   | -                        | -  | -  | -  | -  |
| <b>INSECTS</b>          |                   |                          |    |    |    |    |
| Cl. Insecta             |                   |                          |    |    |    |    |
| <b>MAYFLIES</b>         |                   |                          |    |    |    |    |
| O. Ephemeroptera        |                   |                          |    |    |    |    |
| F. Baetidae             |                   |                          |    |    |    |    |
| Acentrella feropagus    |                   | -                        | 4  | -  | -  | -  |
| <b>STONEFLIES</b>       |                   |                          |    |    |    |    |
| O. Plecoptera           |                   |                          |    |    |    |    |
| F. Capniidae            |                   |                          |    |    |    |    |
| immature                |                   | -                        | 4  | -  | -  | -  |
| <b>TRUE FLIES</b>       |                   |                          |    |    |    |    |
| O. Diptera              |                   |                          |    |    |    |    |
| <b>BITING-MIDGE</b>     |                   |                          |    |    |    |    |
| F. Ceratopogonidae      |                   |                          |    |    |    |    |
| indeterminate           |                   | -                        | 75 | 11 | -  | 57 |
| <b>MIDGES</b>           |                   |                          |    |    |    |    |
| F. Chironomidae         |                   |                          |    |    |    |    |
| chironomid pupae        |                   | 11                       | 14 | -  | 14 | 14 |
| S.F. Chironominae       |                   |                          |    |    |    |    |
| Micropsectra            |                   | 7                        | -  | -  | -  | -  |
| Stictochironomus        |                   | -                        | -  | -  | -  | -  |
| S.F. Diamesinae         |                   |                          |    |    |    |    |
| Diamesa                 |                   | -                        | -  | -  | -  | 4  |
| Pseudokiefferiella      |                   | 14                       | 36 | 4  | 25 | 22 |
| S.F. Orthocladiinae     |                   |                          |    |    |    |    |
| Cardiocladius           |                   | -                        | -  | 4  | -  | 4  |
| Chaetocladius           |                   | -                        | -  | -  | -  | 4  |
| Corynoneura             |                   | -                        | -  | -  | -  | 4  |
| Cricotopus              |                   | 18                       | 32 | 4  | 11 | 11 |
| Cricotopus/Orthocladius |                   | 4                        | 7  | 4  | -  | 25 |
| Diplocladius            |                   | 4                        | -  | -  | -  | -  |
| Eukiefferiella          |                   | -                        | -  | -  | 4  | -  |

**Table F.48: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upstream of the Mine (GO-03) Study Area, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | GO-03 (Upstream of Mine) |       |       |       |       |
|----------------------------------------------------|---------------------------------|--------------------------|-------|-------|-------|-------|
|                                                    |                                 | B1                       | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                 |                                 | -                        | 7     | -     | -     | 4     |
| <i>Hydrosmittia</i>                                |                                 | 4                        | 7     | -     | 11    | -     |
| <i>Krenosmittia</i>                                |                                 | 4                        | 4     | 7     | 18    | 25    |
| <i>Limnophyes</i>                                  |                                 | -                        | -     | -     | -     | -     |
| <i>Metriocnemus</i>                                |                                 | -                        | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | 4                        | 7     | 7     | 4     | 29    |
| <i>Synorthocladius</i>                             |                                 | -                        | -     | -     | -     | -     |
| <i>Tokunagaia</i>                                  |                                 | 4                        | -     | 7     | 7     | 4     |
| <i>Tvetenia</i>                                    |                                 | 43                       | 50    | 29    | 32    | 14    |
| indeterminate                                      |                                 | 7                        | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                            |                                 |                          |       |       |       |       |
| <i>Thienemannimyia</i> complex                     |                                 | -                        | -     | -     | -     | -     |
| <b>F. Empididae</b>                                |                                 |                          |       |       |       |       |
| <i>Clinocera</i>                                   |                                 | -                        | -     | -     | -     | 4     |
| <b>F. Simuliidae</b>                               |                                 |                          |       |       |       |       |
| <i>Gymnopsis</i>                                   |                                 | -                        | -     | -     | -     | -     |
| <i>Metacnephia</i>                                 |                                 | -                        | -     | -     | 4     | 11    |
| <i>Prosimulium</i>                                 |                                 | -                        | -     | -     | 4     | 7     |
| <b>F. Tipulidae</b>                                |                                 |                          |       |       |       |       |
| <i>Dicranota</i>                                   |                                 | -                        | -     | -     | -     | -     |
| <i>Ormosia</i>                                     |                                 | -                        | -     | -     | 4     | -     |
| <i>Tipula</i>                                      |                                 | 4                        | 7     | 4     | 7     | 47    |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 154                      | 269   | 86    | 151   | 319   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 13                       | 13    | 10    | 13    | 19    |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.890                    | 0.898 | 0.924 | 0.936 | 0.944 |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.05                     | 2.94  | 2.96  | 3.23  | 3.63  |
| <b>Dominant Group Composition</b>                  |                                 |                          |       |       |       |       |
| % Nemata                                           |                                 | 7.0                      | 2.7   | 0.0   | 0.0   | 2.3   |
| % Oligochaeta                                      |                                 | 7.0                      | 0.0   | 0.0   | 4.8   | 2.3   |
| % Hydracarina                                      |                                 | 4.7                      | 2.7   | 8.3   | 0.0   | 5.6   |
| % Ephemeroptera                                    |                                 | 0.0                      | 1.3   | 0.0   | 0.0   | 0.0   |
| % Ostracods                                        |                                 | 0.0                      | 0.0   | 0.0   | 0.0   | 0.0   |
| % Chironomids                                      |                                 | 79.1                     | 61.3  | 75.0  | 83.3  | 50.6  |
| % Metal Sensitive Chironomids                      |                                 | 15.3                     | 14.6  | 4.2   | 18.8  | 8.6   |
| % Simuliidae                                       |                                 | 0.0                      | 0.0   | 0.0   | 4.8   | 5.6   |
| % Tipulidae                                        |                                 | 2.3                      | 2.7   | 4.2   | 7.1   | 14.6  |
| <b>Functional Feeding Group Composition</b>        |                                 |                          |       |       |       |       |
| % Collector - Gatherers                            |                                 | 73.0                     | 49.8  | 65.3  | 82.4  | 47.8  |
| % Filterers                                        |                                 | 5.1                      | 0.0   | 0.0   | 4.8   | 5.6   |
| % Shredders                                        |                                 | 17.2                     | 19.5  | 9.7   | 12.8  | 20.7  |
| <b>Habitat Preference Group Composition</b>        |                                 |                          |       |       |       |       |
| % Clingers                                         |                                 | 24.6                     | 18.2  | 13.9  | 12.8  | 18.4  |
| % Sprawlers                                        |                                 | 59.1                     | 48.5  | 65.3  | 75.3  | 43.3  |
| % Burrowers                                        |                                 | 16.3                     | 33.3  | 20.8  | 11.9  | 38.3  |

<sup>a</sup> Bold entries excluded from taxa count

Table F.49: Benthic Invertebrate Community Summary Statistics for Mary River, Mary River Project CREMP, August 2020

| Metric                                              | Area                           | Mean  | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|-----------------------------------------------------|--------------------------------|-------|--------------------|----------------|---------|--------|---------|
| Density<br>(no. organisms / m <sup>2</sup> )        | GO-09 Reference Area           | 886   | 831                | 372            | 315     | 351    | 2,208   |
|                                                     | GO-03 Upstream Area            | 196   | 95.3               | 42.6           | 86      | 154    | 319     |
|                                                     | EO-01 Upper Mine-Exposed Area  | 513   | 420                | 188            | 244     | 351    | 1,258   |
|                                                     | EO-20 Middle Mine-Exposed Area | 1,441 | 553                | 247            | 943     | 1,186  | 2,315   |
|                                                     | CO-05 Lower Mine-Exposed Area  | 906   | 818                | 366            | 269     | 341    | 1,839   |
| Richness<br>(Number of Taxa)                        | GO-09 Reference Area           | 15.0  | 2.0                | 0.9            | 12.0    | 16.0   | 17.0    |
|                                                     | GO-03 Upstream Area            | 13.6  | 3.3                | 1.5            | 10.0    | 13.0   | 19.0    |
|                                                     | EO-01 Upper Mine-Exposed Area  | 15.6  | 2.1                | 0.9            | 12.0    | 16.0   | 17.0    |
|                                                     | EO-20 Middle Mine-Exposed Area | 14.0  | 2.6                | 1.1            | 11.0    | 14.0   | 17.0    |
|                                                     | CO-05 Lower Mine-Exposed Area  | 14.2  | 2.2                | 1.0            | 11.0    | 14.0   | 17.0    |
| Simpson's Evenness                                  | GO-09 Reference Area           | 0.826 | 0.153              | 0.068          | 0.562   | 0.903  | 0.923   |
|                                                     | GO-03 Upstream Area            | 0.918 | 0.024              | 0.011          | 0.890   | 0.924  | 0.944   |
|                                                     | EO-01 Upper Mine-Exposed Area  | 0.913 | 0.016              | 0.007          | 0.889   | 0.916  | 0.933   |
|                                                     | EO-20 Middle Mine-Exposed Area | 0.868 | 0.046              | 0.021          | 0.789   | 0.890  | 0.900   |
|                                                     | CO-05 Lower Mine-Exposed Area  | 0.839 | 0.048              | 0.022          | 0.777   | 0.859  | 0.897   |
| Nemata<br>(% of community)                          | GO-09 Reference Area           | 0.5   | 0.6                | 0.3            | 0.0     | 0.3    | 1.2     |
|                                                     | GO-03 Upstream Area            | 2.4   | 2.9                | 1.3            | 0.0     | 2.3    | 7.0     |
|                                                     | EO-01 Upper Mine-Exposed Area  | 0.8   | 1.2                | 0.5            | 0.0     | 0.0    | 2.8     |
|                                                     | EO-20 Middle Mine-Exposed Area | 0.0   | 0.1                | 0.0            | 0.0     | 0.0    | 0.2     |
|                                                     | CO-05 Lower Mine-Exposed Area  | 1.5   | 0.6                | 0.3            | 1.1     | 1.3    | 2.4     |
| Hydracarina<br>(% of community)                     | GO-09 Reference Area           | 1.1   | 1.3                | 0.6            | 0.0     | 0.9    | 3.2     |
|                                                     | GO-03 Upstream Area            | 4.3   | 3.1                | 1.4            | 0.0     | 4.7    | 8.3     |
|                                                     | EO-01 Upper Mine-Exposed Area  | 3.1   | 2.9                | 1.3            | 0.0     | 2.9    | 7.3     |
|                                                     | EO-20 Middle Mine-Exposed Area | 0.8   | 0.4                | 0.2            | 0.2     | 0.8    | 1.3     |
|                                                     | CO-05 Lower Mine-Exposed Area  | 6.0   | 4.9                | 2.2            | 3.1     | 4.0    | 14.7    |
| Chironomidae<br>(% of community)                    | GO-09 Reference Area           | 89.6  | 5.1                | 2.3            | 83.2    | 87.8   | 96.2    |
|                                                     | GO-03 Upstream Area            | 69.9  | 13.6               | 6.1            | 50.6    | 75.0   | 83.3    |
|                                                     | EO-01 Upper Mine-Exposed Area  | 88.2  | 9.2                | 4.1            | 74.3    | 93.5   | 95.9    |
|                                                     | EO-20 Middle Mine-Exposed Area | 95.5  | 2.5                | 1.1            | 91.7    | 95.8   | 98.2    |
|                                                     | CO-05 Lower Mine-Exposed Area  | 84.8  | 8.0                | 3.6            | 75.3    | 82.7   | 93.4    |
| Metal-Sensitive<br>Chironomidae<br>(% of community) | GO-09 Reference Area           | 32.0  | 23.7               | 10.6           | 10.8    | 24.1   | 68.7    |
|                                                     | GO-03 Upstream Area            | 12.3  | 5.8                | 2.6            | 4.2     | 14.6   | 18.8    |
|                                                     | EO-01 Upper Mine-Exposed Area  | 11.0  | 2.5                | 1.1            | 6.9     | 12.4   | 12.9    |
|                                                     | EO-20 Middle Mine-Exposed Area | 9.4   | 9.1                | 4.1            | 1.6     | 5.2    | 24.4    |
|                                                     | CO-05 Lower Mine-Exposed Area  | 19.4  | 9.6                | 4.3            | 8.5     | 17.1   | 32.4    |
| Tipulidae<br>(% of community)                       | GO-09 Reference Area           | 1.2   | 0.5                | 0.2            | 0.9     | 1.1    | 2.0     |
|                                                     | GO-03 Upstream Area            | 6.2   | 5.1                | 2.3            | 2.3     | 4.2    | 14.6    |
|                                                     | EO-01 Upper Mine-Exposed Area  | 5.7   | 4.3                | 1.9            | 1.1     | 4.4    | 11.9    |
|                                                     | EO-20 Middle Mine-Exposed Area | 0.6   | 0.9                | 0.4            | 0.0     | 0.3    | 2.1     |
|                                                     | CO-05 Lower Mine-Exposed Area  | 1.4   | 0.9                | 0.4            | 0.0     | 1.3    | 2.3     |
| Collector-Gatherer FFG<br>(% of community)          | GO-09 Reference Area           | 80.2  | 4.1                | 1.8            | 74.9    | 81.2   | 85.5    |
|                                                     | GO-03 Upstream Area            | 63.7  | 14.9               | 6.7            | 47.8    | 65.3   | 82.4    |
|                                                     | EO-01 Upper Mine-Exposed Area  | 59.4  | 7.1                | 3.2            | 51.5    | 56.9   | 69.2    |
|                                                     | EO-20 Middle Mine-Exposed Area | 54.6  | 13.2               | 5.9            | 37.0    | 62.3   | 66.3    |
|                                                     | CO-05 Lower Mine-Exposed Area  | 71.0  | 7.0                | 3.1            | 61.7    | 71.6   | 81.0    |

**Table F.49: Benthic Invertebrate Community Summary Statistics for Mary River, Mary River Project CREMP, August 2020**

| Metric                           | Area                           | Mean | Standard Deviation | Standard Error | Minimum | Median | Maximum |
|----------------------------------|--------------------------------|------|--------------------|----------------|---------|--------|---------|
| Filterer FFG<br>(% of community) | GO-09 Reference Area           | 2.0  | 1.8                | 0.8            | 0.0     | 2.0    | 4.9     |
|                                  | GO-03 Upstream Area            | 3.1  | 2.8                | 1.3            | 0.0     | 4.8    | 5.6     |
|                                  | EO-01 Upper Mine-Exposed Area  | 5.2  | 3.6                | 1.6            | 0.0     | 6.2    | 8.4     |
|                                  | EO-20 Middle Mine-Exposed Area | 4.6  | 4.2                | 1.9            | 0.6     | 4.8    | 10.9    |
|                                  | CO-05 Lower Mine-Exposed Area  | 4.3  | 5.0                | 2.2            | 0.0     | 1.2    | 10.1    |
| Shredder FFG<br>(% of community) | GO-09 Reference Area           | 11.3 | 7.1                | 3.2            | 4.7     | 9.3    | 20.1    |
|                                  | GO-03 Upstream Area            | 16.0 | 4.6                | 2.1            | 9.7     | 17.2   | 20.7    |
|                                  | EO-01 Upper Mine-Exposed Area  | 27.3 | 7.0                | 3.1            | 19.6    | 29.4   | 36.6    |
|                                  | EO-20 Middle Mine-Exposed Area | 15.8 | 9.4                | 4.2            | 6.7     | 12.7   | 31.5    |
|                                  | CO-05 Lower Mine-Exposed Area  | 13.5 | 9.3                | 4.2            | 5.3     | 11.0   | 29.1    |
| Clinger HPG<br>(% of community)  | GO-09 Reference Area           | 15.0 | 5.8                | 2.6            | 5.9     | 16.6   | 21.3    |
|                                  | GO-03 Upstream Area            | 17.6 | 4.7                | 2.1            | 12.8    | 18.2   | 24.6    |
|                                  | EO-01 Upper Mine-Exposed Area  | 29.9 | 8.6                | 3.9            | 17.9    | 31.4   | 39.5    |
|                                  | EO-20 Middle Mine-Exposed Area | 20.9 | 12.7               | 5.7            | 11.6    | 17.6   | 43.0    |
|                                  | CO-05 Lower Mine-Exposed Area  | 22.5 | 6.2                | 2.8            | 17.1    | 20.6   | 33.0    |
| Sprawler HPG<br>(% of community) | GO-09 Reference Area           | 79.0 | 5.9                | 2.6            | 69.8    | 80.3   | 85.2    |
|                                  | GO-03 Upstream Area            | 58.3 | 12.8               | 5.7            | 43.3    | 59.1   | 75.3    |
|                                  | EO-01 Upper Mine-Exposed Area  | 57.0 | 5.5                | 2.5            | 49.3    | 56.9   | 64.6    |
|                                  | EO-20 Middle Mine-Exposed Area | 54.2 | 13.0               | 5.8            | 36.6    | 62.3   | 64.8    |
|                                  | CO-05 Lower Mine-Exposed Area  | 71.0 | 5.8                | 2.6            | 63.1    | 70.3   | 79.0    |
| Burrower HPG<br>(% of community) | GO-09 Reference Area           | 6.0  | 10.2               | 4.6            | 1.1     | 1.3    | 24.3    |
|                                  | GO-03 Upstream Area            | 24.1 | 11.3               | 5.0            | 11.9    | 20.8   | 38.3    |
|                                  | EO-01 Upper Mine-Exposed Area  | 13.1 | 5.2                | 2.3            | 7.3     | 11.2   | 19.5    |
|                                  | EO-20 Middle Mine-Exposed Area | 24.9 | 12.5               | 5.6            | 13.0    | 23.6   | 45.8    |
|                                  | CO-05 Lower Mine-Exposed Area  | 6.4  | 2.7                | 1.2            | 3.9     | 6.7    | 10.2    |



**Table F.50: Benthic Invertebrate Community Metric Statistical Comparison Results among Mary River Reference (GO-09), Upstream (GO-03) and Mine-Exposed (EO-01, EO-20, CO-05) Study Areas, Mary River Project CREMP, August 2020**

| Metric                                  | Overall 5-Area Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |      |                         |                                              |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|------|-------------------------|----------------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Areas? | P-value | Area                            | Mean | Standard Deviation (SD) | Magnitude of Difference (GO-09 Reference SD) | Pairwise Comparison |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.006   | GO-09 Ref                       | 80.2 | 4.1                     | -                                            | a                   |
|                                         |                               |                     |                                     |         | G0-03                           | 63.7 | 14.9                    | -4.1                                         | a,b                 |
|                                         |                               |                     |                                     |         | E0-01                           | 59.4 | 7.1                     | -5.1                                         | b                   |
|                                         |                               |                     |                                     |         | E0-20                           | 54.6 | 13.2                    | -6.3                                         | b                   |
|                                         |                               |                     |                                     |         | C0-05                           | 71.0 | 7.0                     | -2.3                                         | a,b                 |
| Filterer FFG (% of community)           | ANOVA                         | none                | NO                                  | 0.667   | GO-09 Ref                       | 2.0  | 1.8                     | -                                            | a                   |
|                                         |                               |                     |                                     |         | G0-03                           | 3.1  | 2.8                     | 0.6                                          | a                   |
|                                         |                               |                     |                                     |         | E0-01                           | 5.2  | 3.6                     | 1.7                                          | a                   |
|                                         |                               |                     |                                     |         | E0-20                           | 4.6  | 4.2                     | 1.4                                          | a                   |
|                                         |                               |                     |                                     |         | C0-05                           | 4.3  | 5.0                     | 1.3                                          | a                   |
| Shredder FFG (% of community)           | ANOVA                         | log10               | YES                                 | 0.051   | GO-09 Ref                       | 11.3 | 7.1                     | -                                            | b                   |
|                                         |                               |                     |                                     |         | G0-03                           | 16.0 | 4.6                     | 0.7                                          | a,b                 |
|                                         |                               |                     |                                     |         | E0-01                           | 27.3 | 7.0                     | 2.2                                          | a                   |
|                                         |                               |                     |                                     |         | E0-20                           | 15.8 | 9.4                     | 0.6                                          | a,b                 |
|                                         |                               |                     |                                     |         | C0-05                           | 13.5 | 9.3                     | 0.3                                          | a,b                 |
| Clinger HPG (% of community)            | ANOVA                         | log10               | YES                                 | 0.068   | GO-09 Ref                       | 15.0 | 5.8                     | -                                            | a                   |
|                                         |                               |                     |                                     |         | G0-03                           | 17.6 | 4.7                     | 0.4                                          | b,a                 |
|                                         |                               |                     |                                     |         | E0-01                           | 29.9 | 8.6                     | 2.6                                          | b                   |
|                                         |                               |                     |                                     |         | E0-20                           | 20.9 | 12.7                    | 1.0                                          | b,a                 |
|                                         |                               |                     |                                     |         | C0-05                           | 22.5 | 6.2                     | 1.3                                          | b,a                 |
| Sprawler HPG (% of community)           | ANOVA                         | log10               | YES                                 | 0.005   | GO-09 Ref                       | 79.0 | 5.9                     | -                                            | a                   |
|                                         |                               |                     |                                     |         | G0-03                           | 58.3 | 12.8                    | -3.5                                         | b,c                 |
|                                         |                               |                     |                                     |         | E0-01                           | 57.0 | 5.5                     | -3.7                                         | b,c                 |
|                                         |                               |                     |                                     |         | E0-20                           | 54.2 | 13.0                    | -4.2                                         | c                   |
|                                         |                               |                     |                                     |         | C0-05                           | 71.0 | 5.8                     | -1.4                                         | a,b                 |
| Burrower HPG (% of community)           | K-W                           | rank                | YES                                 | 0.009   | GO-09 Ref                       | 6.0  | 10.2                    | -                                            | b                   |
|                                         |                               |                     |                                     |         | G0-03                           | 24.1 | 11.3                    | 1.8                                          | a                   |
|                                         |                               |                     |                                     |         | E0-01                           | 13.1 | 5.2                     | 0.7                                          | a,b                 |
|                                         |                               |                     |                                     |         | E0-20                           | 24.9 | 12.5                    | 1.9                                          | a                   |
|                                         |                               |                     |                                     |         | C0-05                           | 6.4  | 2.7                     | 0.0                                          | b                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Blue shaded values indicate significant difference (ANOVA p-value ≤ 0.10) that was also outside of a Critical Effect Size of ±2 SD<sub>REF</sub>, indicating that the difference between the mine-exposed area and reference area was ecologically meaningful.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).



**Table F.51: Statistical Comparison of Bray-Curtis Index for the Mary River Mine-exposed Areas Compared to the Upstream Reference Area, Mary River Project CREMP, August 2020**

| Comparison     | Betadisper<br>P-Value | Mantel Test |                |         | dbRDA   |                |                               |         |
|----------------|-----------------------|-------------|----------------|---------|---------|----------------|-------------------------------|---------|
|                |                       | r           | R <sup>2</sup> | P-Value | F-Value | R <sup>2</sup> | R <sup>2</sup> <sub>adj</sub> | P-Value |
| G0-03 vs G0-09 | 0.041                 | 0.679       | 0.461          | 0.008   | 4.16    | 0.342          | 0.260                         | 0.007   |
| E0-01 vs G0-09 | 0.820                 | 0.554       | 0.307          | 0.008   | 3.46    | 0.302          | 0.214                         | 0.005   |
| E0-20 vs G0-09 | 0.056                 | 0.743       | 0.552          | 0.008   | 5.35    | 0.401          | 0.326                         | 0.005   |
| C0-05 vs G0-09 | 0.379                 | 0.629       | 0.396          | 0.008   | 5.37    | 0.402          | 0.327                         | 0.007   |

Highlighted values indicate significant difference between study areas based on statistical test p-value less than 0.10.  
Note: Sample size was five for all study areas..

**Table F.52: Statistical Comparison of Benthic Invertebrate Community Metrics at Mary River Upstream of the Mine (G0-03) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10               | YES                                 | 0.005   | 2007                                         | 3               | 136   | 29                 | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 169   | 122                | 1.1                                | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 287   | 92                 | 5.1                                | a,b                 |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 282   | 172                | 5.0                                | a,b                 |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 165   | 54                 | 1.0                                | a                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 634   | 315                | 17.0                               | b                   |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 196   | 95.3               | 2.0                                | a                   |
| Richness (No. of Taxa)                | ANOVA                         | none                | YES                                 | 0.011   | 2007                                         | 3               | 6.3   | 1.2                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 9.4   | 3.5                | 2.7                                | a,b                 |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 14.4  | 1.8                | 7.0                                | b                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 13.6  | 3.9                | 6.3                                | b                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 12.2  | 3.5                | 5.1                                | a,b                 |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 11.2  | 1.6                | 4.2                                | a,b                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 13.6  | 3.3                | 6.3                                | b                   |
| Simpson's Evenness                    | K-W                           | rank                | YES                                 | 0.055   | 2007                                         | 3               | 0.591 | 0.003              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 0.921 | 0.045              | 114.3                              | b                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 0.899 | 0.041              | 106.5                              | b,c                 |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 0.873 | 0.142              | 97.7                               | b,c                 |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 0.868 | 0.119              | 96.0                               | b,c                 |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 0.858 | 0.048              | 92.4                               | a,c                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 0.918 | 0.0238             | 113.2                              | b,c                 |
| Nemata (% of community)               | K-W                           | rank                | YES                                 | 0.005   | 2007                                         | 3               | 0.0   | 1.2                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 0.0   | 0.0                | 0.0                                | b                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 2.2   | 1.3                | 1.9                                | c,d                 |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 1.3   | 1.2                | 1.1                                | a,b,d               |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 4.4   | 2.2                | 3.7                                | c                   |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 0.7   | 1.2                | 0.6                                | a,b                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 2.38  | 2.85               | 2.0                                | a,c,d               |
| Hydracarina (% of community)          | ANOVA                         | log10(x+1)          | YES                                 | 0.002   | 2007                                         | 3               | 0.0   | 3.4                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 8.0   | 4.5                | 2.4                                | b,c                 |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 10.3  | 4.4                | 3.1                                | b                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 1.9   | 1.9                | 0.6                                | a,c                 |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 3.3   | 4.1                | 1.0                                | a,c                 |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 2.4   | 1.9                | 0.7                                | a,c                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 4.3   | 3.1                | 1.3                                | a,b,c               |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | 0.001   | 2007                                         | 3               | 100.0 | 8.6                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 71.9  | 8.2                | -3.3                               | b                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 77.9  | 8.0                | -2.6                               | b,c                 |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 75.3  | 10.3               | -2.9                               | b                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 83.2  | 9.2                | -2.0                               | a,b,c               |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 92.9  | 7.2                | -0.8                               | a,c                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 69.9  | 13.6               | -3.5                               | b                   |
| Metal Sensitive Taxa (% of community) | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                                         | 3               | 6.6   | 3.0                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                                         | 5               | 7.9   | 4.9                | 0.4                                | a                   |
|                                       |                               |                     |                                     |         | 2016                                         | 5               | 8.8   | 5.9                | 0.7                                | a                   |
|                                       |                               |                     |                                     |         | 2017                                         | 5               | 46.9  | 12.6               | 13.3                               | b                   |
|                                       |                               |                     |                                     |         | 2018                                         | 5               | 32.5  | 21.5               | 8.5                                | b,c                 |
|                                       |                               |                     |                                     |         | 2019                                         | 5               | 17.4  | 11.2               | 3.5                                | a,c                 |
|                                       |                               |                     |                                     |         | 2020                                         | 5               | 12.3  | 5.8                | 1.9                                | a                   |

**Table F.52: Statistical Comparison of Benthic Invertebrate Community Metrics at Mary River Upstream of the Mine (G0-03) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Tipulidae (% of community)              | ANOVA                         | none                | YES                                 | <0.001  | 2007                                         | 3               | 0.0  | 4.6                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 18.0 | 8.4                | 3.9                                | b                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 8.3  | 7.3                | 1.8                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 2.9  | 2.0                | 0.6                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 1.8  | 1.7                | 0.4                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 2.5  | 3.6                | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 6.2  | 5.1                | 1.3                                | a                   |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | 0.002   | 2007                                         | 3               | 93.3 | 5.8                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 62.1 | 11.0               | -5.4                               | b                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 63.5 | 6.4                | -5.2                               | b,c                 |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 74.2 | 10.6               | -3.3                               | a,b,c               |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 80.7 | 11.4               | -2.2                               | a,c                 |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 68.9 | 10.8               | -4.2                               | b,c                 |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 63.7 | 14.9               | -5.1                               | b,c                 |
| Filterer FFG (% of community)           | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                                         | 3               | 0.0  | 2.2                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 0.0  | 0.0                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 0.3  | 0.7                | 0.1                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 15.2 | 5.4                | 6.8                                | b                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 3.7  | 5.1                | 1.6                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 0.0  | 0.0                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 3.1  | 2.8                | 1.4                                | a                   |
| Shredder FFG (% of community)           | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                                         | 3               | 6.7  | 5.8                | -                                  | a,b                 |
|                                         |                               |                     |                                     |         | 2015                                         | 5               | 30.0 | 7.1                | 4.0                                | c                   |
|                                         |                               |                     |                                     |         | 2016                                         | 5               | 20.7 | 5.5                | 2.4                                | c,d                 |
|                                         |                               |                     |                                     |         | 2017                                         | 5               | 5.7  | 2.2                | -0.2                               | b                   |
|                                         |                               |                     |                                     |         | 2018                                         | 5               | 11.7 | 8.2                | 0.9                                | a,b,d               |
|                                         |                               |                     |                                     |         | 2019                                         | 5               | 22.2 | 5.6                | 2.7                                | c,d                 |
|                                         |                               |                     |                                     |         | 2020                                         | 5               | 16.0 | 4.6                | 1.6                                | a,d                 |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.53: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upper Mine-Exposed (EO-01) Study Area, August 2020**

| Taxa                    | Study Area<br>Replicate Station | EO-01 (Upper Mine-Exposed) |    |    |    |    |
|-------------------------|---------------------------------|----------------------------|----|----|----|----|
|                         |                                 | B1                         | B2 | B3 | B4 | B5 |
| <hr/>                   |                                 |                            |    |    |    |    |
| <hr/>                   |                                 |                            |    |    |    |    |
| ROUNDWORMS              |                                 |                            |    |    |    |    |
| P. Nemata               |                                 | -                          | 4  | 11 | -  | -  |
| ANNELIDS                |                                 |                            |    |    |    |    |
| P. Annelida             |                                 |                            |    |    |    |    |
| WORMS                   |                                 |                            |    |    |    |    |
| Cl. Oligochaeta         |                                 |                            |    |    |    |    |
| F. Enchytraeidae        |                                 | 25                         | 4  | 7  | -  | -  |
| ARTHROPODS              |                                 |                            |    |    |    |    |
| P. Arthropoda           |                                 |                            |    |    |    |    |
| MITES                   |                                 |                            |    |    |    |    |
| Cl. Arachnida           |                                 |                            |    |    |    |    |
| O. Acarina              |                                 |                            |    |    |    |    |
| F. Sperchonidae         |                                 |                            |    |    |    |    |
| Sperchon                |                                 | 36                         | 14 | 29 | 4  | -  |
| SEED SHRIMPS            |                                 |                            |    |    |    |    |
| Cl. Ostracoda           |                                 | -                          | 4  | -  | -  | -  |
| SPRINGTAILS             |                                 |                            |    |    |    |    |
| Cl. Entognatha          |                                 |                            |    |    |    |    |
| O. Collembola           |                                 | 4                          | -  | -  | -  | -  |
| INSECTS                 |                                 |                            |    |    |    |    |
| Cl. Insecta             |                                 |                            |    |    |    |    |
| MAYFLIES                |                                 |                            |    |    |    |    |
| O. Ephemeroptera        |                                 |                            |    |    |    |    |
| F. Baetidae             |                                 |                            |    |    |    |    |
| Acentrella feropagus    |                                 | -                          | 4  | 4  | -  | -  |
| STONEFLIES              |                                 |                            |    |    |    |    |
| O. Plecoptera           |                                 |                            |    |    |    |    |
| F. Capniidae            |                                 |                            |    |    |    |    |
| immature                |                                 | -                          | -  | -  | -  | -  |
| TRUE FLIES              |                                 |                            |    |    |    |    |
| O. Diptera              |                                 |                            |    |    |    |    |
| BITING-MIDGE            |                                 |                            |    |    |    |    |
| F. Ceratopogonidae      |                                 |                            |    |    |    |    |
| indeterminate           |                                 | 4                          | -  | -  | -  | -  |
| MIDGES                  |                                 |                            |    |    |    |    |
| F. Chironomidae         |                                 |                            |    |    |    |    |
| chironomid pupae        |                                 | 108                        | 29 | 22 | 11 | 29 |
| S.F. Chironominae       |                                 |                            |    |    |    |    |
| Micropsectra            |                                 | -                          | 18 | 7  | 29 | 14 |
| Stictochironomus        |                                 | -                          | -  | -  | -  | -  |
| S.F. Diamesinae         |                                 |                            |    |    |    |    |
| Diamesa                 |                                 | 18                         | -  | -  | 11 | 7  |
| Pseudokiefferiella      |                                 | 129                        | 18 | 18 | 4  | -  |
| S.F. Orthocladiinae     |                                 |                            |    |    |    |    |
| Cardiocladius           |                                 | 36                         | 4  | 4  | 14 | 32 |
| Chaetocladius           |                                 | -                          | -  | -  | 4  | -  |
| Corynoneura             |                                 | 7                          | -  | 4  | 14 | 4  |
| Cricotopus              |                                 | 151                        | 61 | 14 | 54 | 22 |
| Cricotopus/Orthocladius |                                 | 251                        | 29 | 50 | 57 | 22 |
| Diplocladius            |                                 | -                          | -  | -  | -  | -  |
| Eukiefferiella          |                                 | -                          | -  | -  | -  | -  |

**Table F.53: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Upper Mine-Exposed (EO-01) Study Area, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | EO-01 (Upper Mine-Exposed) |       |           |           |       |
|----------------------------------------------------|---------------------------------|----------------------------|-------|-----------|-----------|-------|
|                                                    |                                 | B1                         | B2    | B3        | B4        | B5    |
| <i>Hydrobaenus</i>                                 |                                 | 22                         | 7     | -         | 4         | 4     |
| <i>Hydrosmittia</i>                                |                                 | 11                         | 11    | 11        | 4         | -     |
| <i>Krenosmittia</i>                                |                                 | -                          | 11    | 14        | 14        | 7     |
| <i>Limnophyes</i>                                  |                                 | 7                          | 4     | -         | 4         | -     |
| <i>Metriocnemus</i>                                |                                 | 36                         | -     | -         | -         | -     |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | 65                         | 18    | 39        | 32        | 11    |
| <i>Synorthocladius</i>                             |                                 | -                          | -     | -         | -         | -     |
| <i>Tokunagaia</i>                                  |                                 | 100                        | 11    | 18        | 29        | 25    |
| <i>Tvetenia</i>                                    |                                 | 158                        | 50    | 39        | 39        | 54    |
| indeterminate                                      |                                 | <b>79</b>                  | -     | <b>50</b> | <b>14</b> | -     |
| <b>S.F. Tanypodinae</b>                            |                                 |                            |       |           |           |       |
| <i>Thienemannimyia</i> complex                     |                                 | -                          | -     | -         | -         | -     |
| <b>F. Empididae</b>                                |                                 |                            |       |           |           |       |
| <i>Clinocera</i>                                   |                                 | -                          | -     | -         | -         | -     |
| <b>F. Simuliidae</b>                               |                                 |                            |       |           |           |       |
| <i>Gymnopsis</i>                                   |                                 | -                          | -     | -         | -         | -     |
| <i>Metacnephia</i>                                 |                                 | -                          | -     | 4         | -         | -     |
| <i>Prosimulium</i>                                 |                                 | -                          | -     | -         | -         | 4     |
| <b>F. Tipulidae</b>                                |                                 |                            |       |           |           |       |
| <i>Dicranota</i>                                   |                                 | -                          | -     | -         | -         | -     |
| <i>Ormosia</i>                                     |                                 | -                          | -     | -         | -         | -     |
| <i>Tipula</i>                                      |                                 | 14                         | 25    | 47        | 11        | 11    |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 1,258                      | 323   | 391       | 351       | 244   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 17                         | 17    | 16        | 16        | 12    |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.889                      | 0.912 | 0.917     | 0.916     | 0.933 |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.070                      | 3.350 | 3.280     | 3.250     | 3.090 |
| <b>Dominant Group Composition</b>                  |                                 |                            |       |           |           |       |
| % Nemata                                           |                                 | 0.0                        | 1.1   | 2.8       | 0.0       | 0.0   |
| % Oligochaeta                                      |                                 | 2.0                        | 1.1   | 1.8       | 0.0       | 0.0   |
| % Hydracarina                                      |                                 | 2.9                        | 4.4   | 7.3       | 1.0       | 0.0   |
| % Ephemeroptera                                    |                                 | 0.0                        | 1.1   | 0.9       | 0.0       | 0.0   |
| % Ostracods                                        |                                 | 0.0                        | 1.1   | 0.0       | 0.0       | 0.0   |
| % Chironomids                                      |                                 | 93.5                       | 83.3  | 74.3      | 95.9      | 94.1  |
| % Metal Sensitive Chironomids                      |                                 | 12.9                       | 12.4  | 6.9       | 12.6      | 10.1  |
| % Simuliidae                                       |                                 | 0.0                        | 0.0   | 0.9       | 0.0       | 1.5   |
| % Tipulidae                                        |                                 | 1.1                        | 7.8   | 11.9      | 3.1       | 4.4   |
| <b>Functional Feeding Group Composition</b>        |                                 |                            |       |           |           |       |
| % Collector - Gatherers                            |                                 | 64.0                       | 51.5  | 69.2      | 56.9      | 55.5  |
| % Filterers                                        |                                 | 0.0                        | 6.2   | 2.9       | 8.4       | 8.2   |
| % Shredders                                        |                                 | 29.7                       | 36.6  | 19.6      | 29.4      | 21.2  |
| <b>Habitat Preference Group Composition</b>        |                                 |                            |       |           |           |       |
| % Clingers                                         |                                 | 31.4                       | 39.5  | 17.9      | 35.8      | 25.0  |
| % Sprawlers                                        |                                 | 58.6                       | 49.3  | 64.6      | 56.9      | 55.5  |
| % Burrowers                                        |                                 | 9.7                        | 11.2  | 17.5      | 7.3       | 19.5  |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.54:** Statistical Comparison of Benthic Invertebrate Community Metrics at the Mary River Upper Mine-Exposed Area (E0-01) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP

| Metric                                | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                                    |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | log10               | YES                                 | 0.011   | 2007                            | 3               | 797   | 648                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 116   | 97                 | -1.1                               | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 230   | 109                | -0.9                               | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 126   | 106                | -1.0                               | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 119   | 164                | -1.0                               | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 312   | 115                | -0.7                               | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 513   | 420                | -0.4                               | b                   |
| Richness (No. of Taxa)                | ANOVA                         | none                | YES                                 | 0.025   | 2007                            | 3               | 16.3  | 8.1                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 7.8   | 2.7                | -1.0                               | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 13.2  | 4.1                | -0.4                               | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 10.6  | 5.3                | -0.7                               | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 7.8   | 4.9                | -1.0                               | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 11.0  | 0.7                | -0.7                               | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 15.6  | 2.07               | -0.1                               | b                   |
| Simpson's Evenness                    | ANOVA                         | log10               | YES                                 | <0.001  | 2007                            | 3               | 0.698 | 0.059              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.873 | 0.095              | 3.0                                | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.865 | 0.037              | 2.8                                | b                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.940 | 0.053              | 4.1                                | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.926 | 0.037              | 3.9                                | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.898 | 0.028              | 3.4                                | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.913 | 0.0159             | 3.7                                | b                   |
| Nemata (% of community)               | K-W                           | rank                | NO                                  | 0.467   | 2007                            | 3               | 2.1   | 3.6                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.0   | 4.5                | 0.0                                | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1.3   | 1.3                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.8   | 1.8                | -0.4                               | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 7.8   | 10.7               | 1.6                                | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1.3   | 1.6                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.8   | 1.2                | -0.4                               | a                   |
| Hydracarina (% of community)          | ANOVA                         | none                | NO                                  | 0.271   | 2007                            | 3               | 3.3   | 5.8                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.0   | 4.5                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 7.2   | 4.6                | 0.7                                | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 2.2   | 2.1                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 4.4   | 5.2                | 0.2                                | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 4.1   | 2.5                | 0.1                                | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 3.1   | 2.9                | 0.0                                | a                   |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | 0.013   | 2007                            | 3               | 90.0  | 0.1                | -                                  | a,b,c               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 82.5  | 8.3                | -74.8                              | a,b,c               |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 82.9  | 7.3                | -70.9                              | a,b,c               |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 78.1  | 7.2                | -118.7                             | b,c                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 72.0  | 16.0               | -179.8                             | c                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 93.7  | 3.4                | 36.8                               | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 88.2  | 9.2                | -18.0                              | a,b                 |
| Metal Sensitive Taxa (% of community) | K-W                           | rank                | YES                                 | 0.031   | 2007                            | 3               | 36.4  | 32.0               | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 7.4   | 7.7                | -0.9                               | a,c                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 5.7   | 4.7                | -1.0                               | c                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 29.0  | 8.2                | -0.2                               | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 35.2  | 20.2               | 0.0                                | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 5.1   | 4.0                | -1.0                               | c                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 11.0  | 2.5                | -0.8                               | a,b,c               |

**Table F.54: Statistical Comparison of Benthic Invertebrate Community Metrics at the Mary River Upper Mine-Exposed Area (E0-01) Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Tipulidae (% of community)              | K-W                           | rank                | YES                                 | 0.002   | 2007                            | 3               | 3.3  | 5.8                | -                                  | a,b,c               |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 10.0 | 7.1                | 1.2                                | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 2.5  | 2.6                | -0.2                               | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 0.3  | 0.6                | -0.5                               | d                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 0.3  | 0.8                | -0.5                               | c,d                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.7  | 0.9                | -0.5                               | b,c,d               |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 5.7  | 4.3                | 0.4                                | a                   |
| Collector-Gatherer FFG (% of community) | K-W                           | rank                | YES                                 | 0.069   | 2007                            | 3               | 40.0 | 26.5               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 72.2 | 16.5               | 1.2                                | a,b                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 77.9 | 6.9                | 1.4                                | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 80.3 | 8.5                | 1.5                                | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 62.4 | 37.2               | 0.8                                | a,b                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 64.0 | 2.1                | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 59.4 | 7.1                | 0.7                                | a                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.011   | 2007                            | 3               | 36.7 | 32.1               | -                                  | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.0  | 0.0                | -1.1                               | c                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 0.9  | 0.8                | -1.1                               | a,c,d               |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 14.0 | 11.2               | -0.7                               | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 7.0  | 8.6                | -0.9                               | a,b,d               |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.4  | 0.8                | -1.1                               | c,d                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 5.2  | 3.6                | -1.0                               | a,b                 |
| Shredder FFG (% of community)           | K-W                           | rank                | YES                                 | 0.006   | 2007                            | 3               | 6.7  | 11.5               | -                                  | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 18.0 | 17.9               | 1.0                                | a,c                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 7.4  | 7.6                | 0.1                                | a,b                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 2.5  | 5.5                | -0.4                               | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 15.6 | 13.5               | 0.8                                | a,c                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 24.3 | 3.4                | 1.5                                | c                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 27.3 | 7.0                | 1.8                                | c                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.55: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Middle Mine-Exposed (EO-20) Study Area, August 2020**

| Taxa                          | Study Area<br>Replicate Station | EO-20 (Middle Mine-Exposed) |     |     |     |     |
|-------------------------------|---------------------------------|-----------------------------|-----|-----|-----|-----|
|                               |                                 | B1                          | B2  | B3  | B4  | B5  |
| <hr/>                         |                                 |                             |     |     |     |     |
| <hr/>                         |                                 |                             |     |     |     |     |
| ROUNDWORMS                    |                                 |                             |     |     |     |     |
| P. Nemata                     |                                 | -                           | 4   | -   | -   | -   |
| ANNELIDS                      |                                 |                             |     |     |     |     |
| P. Annelida                   |                                 |                             |     |     |     |     |
| WORMS                         |                                 |                             |     |     |     |     |
| Cl. Oligochaeta               |                                 |                             |     |     |     |     |
| F. Enchytraeidae              |                                 | -                           | -   | 4   | -   | 22  |
| ARTHROPODS                    |                                 |                             |     |     |     |     |
| P. Arthropoda                 |                                 |                             |     |     |     |     |
| MITES                         |                                 |                             |     |     |     |     |
| Cl. Arachnida                 |                                 |                             |     |     |     |     |
| O. Acarina                    |                                 |                             |     |     |     |     |
| F. Sperchonidae               |                                 |                             |     |     |     |     |
| <i>Sperchon</i>               |                                 | 18                          | 4   | 11  | 14  | 7   |
| SEED SHRIMPS                  |                                 |                             |     |     |     |     |
| Cl. Ostracoda                 |                                 | -                           | -   | 4   | -   | -   |
| SPRINGTAILS                   |                                 |                             |     |     |     |     |
| Cl. Entognatha                |                                 |                             |     |     |     |     |
| O. Collembola                 |                                 | -                           | 4   | -   | -   | -   |
| INSECTS                       |                                 |                             |     |     |     |     |
| Cl. Insecta                   |                                 |                             |     |     |     |     |
| MAYFLIES                      |                                 |                             |     |     |     |     |
| O. Ephemeroptera              |                                 |                             |     |     |     |     |
| F. Baetidae                   |                                 |                             |     |     |     |     |
| <i>Acentrella feropagus</i>   |                                 | -                           | -   | -   | -   | -   |
| STONEFLIES                    |                                 |                             |     |     |     |     |
| O. Plecoptera                 |                                 |                             |     |     |     |     |
| F. Capniidae                  |                                 |                             |     |     |     |     |
| immature                      |                                 | -                           | -   | -   | -   | -   |
| TRUE FLIES                    |                                 |                             |     |     |     |     |
| O. Diptera                    |                                 |                             |     |     |     |     |
| BITING-MIDGE                  |                                 |                             |     |     |     |     |
| F. Ceratopogonidae            |                                 |                             |     |     |     |     |
| indeterminate                 |                                 | 22                          | 7   | 7   | 14  | -   |
| MIDGES                        |                                 |                             |     |     |     |     |
| F. Chironomidae               |                                 |                             |     |     |     |     |
| chironomid pupae              |                                 | 240                         | 161 | 50  | 72  | 140 |
| S.F. Chironominae             |                                 |                             |     |     |     |     |
| <i>Micropsectra</i>           |                                 | 201                         | 72  | -   | -   | -   |
| <i>Stictochironomus</i>       |                                 | -                           | -   | -   | -   | -   |
| S.F. Diamesinae               |                                 |                             |     |     |     |     |
| <i>Diamesa</i>                |                                 | 61                          | 36  | 7   | 50  | 50  |
| <i>Pseudokiefferiella</i>     |                                 | 244                         | 57  | 7   | 4   | -   |
| S.F. Orthoclaadiinae          |                                 |                             |     |     |     |     |
| <i>Cardiocladius</i>          |                                 | 244                         | 258 | 394 | 237 | 208 |
| <i>Chaetocladius</i>          |                                 | 29                          | -   | -   | -   | -   |
| <i>Corynoneura</i>            |                                 | 4                           | -   | -   | -   | -   |
| <i>Cricotopus</i>             |                                 | 272                         | 86  | 79  | 54  | 65  |
| <i>Cricotopus/Orthocladus</i> |                                 | 530                         | 272 | 115 | 36  | 93  |
| <i>Diplocladius</i>           |                                 | -                           | -   | -   | -   | -   |
| <i>Eukiefferiella</i>         |                                 | -                           | -   | -   | -   | -   |



**Table F.55: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Middle Mine-Exposed (EO-20) Study Area, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | EO-20 (Middle Mine-Exposed) |            |           |       |           |
|----------------------------------------------------|---------------------------------|-----------------------------|------------|-----------|-------|-----------|
|                                                    |                                 | B1                          | B2         | B3        | B4    | B5        |
| <i>Hydrobaenus</i>                                 |                                 | 14                          | -          | 7         | -     | -         |
| <i>Hydrosmittia</i>                                |                                 | -                           | -          | -         | -     | -         |
| <i>Krenosmittia</i>                                |                                 | 14                          | -          | 22        | -     | -         |
| <i>Limnophyes</i>                                  |                                 | -                           | -          | -         | -     | -         |
| <i>Metriocnemus</i>                                |                                 | -                           | -          | -         | -     | -         |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | 115                         | 143        | 79        | 72    | 75        |
| <i>Synorthocladius</i>                             |                                 | -                           | -          | -         | -     | -         |
| <i>Tokunagaia</i>                                  |                                 | 158                         | 369        | 36        | 355   | 247       |
| <i>Tvetenia</i>                                    |                                 | 115                         | 43         | 79        | 147   | 237       |
| indeterminate                                      |                                 | -                           | <b>115</b> | <b>29</b> | -     | <b>11</b> |
| <b>S.F. Tanypodinae</b>                            |                                 |                             |            |           |       |           |
| <i>Thienemannimyia</i> complex                     |                                 | -                           | -          | -         | -     | -         |
| <b>F. Empididae</b>                                |                                 |                             |            |           |       |           |
| <i>Clinocera</i>                                   |                                 | -                           | -          | -         | -     | -         |
| <b>F. Simuliidae</b>                               |                                 |                             |            |           |       |           |
| <i>Gymnopsis</i>                                   |                                 | -                           | -          | -         | 11    | -         |
| <i>Metacnephia</i>                                 |                                 | 25                          | 7          | 4         | 22    | 7         |
| <i>Prosimulium</i>                                 |                                 | 4                           | 4          | 7         | 32    | -         |
| <b>F. Tipulidae</b>                                |                                 |                             |            |           |       |           |
| <i>Dicranota</i>                                   |                                 | -                           | -          | -         | -     | 4         |
| <i>Ormosia</i>                                     |                                 | -                           | -          | -         | -     | -         |
| <i>Tipula</i>                                      |                                 | 7                           | -          | 4         | -     | 22        |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 2,315                       | 1,642      | 943       | 1,118 | 1,186     |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 17                          | 14         | 16        | 12    | 11        |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.890                       | 0.894      | 0.789     | 0.868 | 0.900     |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 3.060                       | 2.810      | 2.500     | 2.710 | 2.690     |
| <b>Dominant Group Composition</b>                  |                                 |                             |            |           |       |           |
| % Nemata                                           |                                 | 0.0                         | 0.2        | 0.0       | 0.0   | 0.0       |
| % Oligochaeta                                      |                                 | 0.0                         | 0.0        | 0.4       | 0.0   | 1.8       |
| % Hydracarina                                      |                                 | 0.8                         | 0.2        | 1.1       | 1.3   | 0.6       |
| % Ephemeroptera                                    |                                 | 0.0                         | 0.0        | 0.0       | 0.0   | 0.0       |
| % Ostracods                                        |                                 | 0.0                         | 0.0        | 0.4       | 0.0   | 0.0       |
| % Chironomids                                      |                                 | 96.8                        | 98.2       | 95.8      | 91.7  | 94.9      |
| % Metal Sensitive Chironomids                      |                                 | 24.4                        | 11.2       | 1.6       | 5.2   | 4.8       |
| % Simuliidae                                       |                                 | 1.2                         | 0.7        | 1.1       | 5.8   | 0.6       |
| % Tipulidae                                        |                                 | 0.3                         | 0.0        | 0.4       | 0.0   | 2.1       |
| <b>Functional Feeding Group Composition</b>        |                                 |                             |            |           |       |           |
| % Collector - Gatherers                            |                                 | 44.0                        | 63.6       | 37.0      | 62.3  | 66.3      |
| % Filterers                                        |                                 | 10.9                        | 5.5        | 1.1       | 4.8   | 0.6       |
| % Shredders                                        |                                 | 31.5                        | 12.7       | 15.7      | 6.7   | 12.2      |
| <b>Habitat Preference Group Composition</b>        |                                 |                             |            |           |       |           |
| % Clingers                                         |                                 | 43.0                        | 18.5       | 17.6      | 13.7  | 11.6      |
| % Sprawlers                                        |                                 | 44.0                        | 63.2       | 36.6      | 62.3  | 64.8      |
| % Burrowers                                        |                                 | 13.0                        | 18.1       | 45.8      | 24.0  | 23.6      |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.56: Statistical Comparison of Benthic Invertebrate Community Metrics at the Mary River Middle Mine-Exposed Area (E0-20) Among Years of Mine Operation (2015 to 2020) and Baseline (2011) for the Mary River Project CREMP**

| Metric                                | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                                    |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2011 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )     | K-W                           | rank                | YES                                 | <0.001  | 2007                            | 3               | 854   | 348                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 278   | 146                | -1.7                               | b,c                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 283   | 118                | -1.6                               | b,c                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 382   | 665                | -1.4                               | c                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 61    | 23                 | -2.3                               | c                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2,939 | 3,175              | 6.0                                | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 1,441 | 553                | 1.7                                | a                   |
| Richness (No. of Taxa)                | ANOVA                         | none                | YES                                 | 0.005   | 2007                            | 3               | 14.0  | 2.6                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 11.6  | 2.2                | -0.9                               | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 13.6  | 3.1                | -0.2                               | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 12.4  | 5.0                | -0.6                               | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 6.8   | 1.9                | -2.7                               | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 14.8  | 2.0                | 0.3                                | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 14    | 2.55               | 0.0                                | a                   |
| Simpson's Evenness                    | K-W                           | rank                | YES                                 | 0.025   | 2007                            | 3               | 0.483 | 0.247              | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.726 | 0.140              | 1.0                                | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.835 | 0.038              | 1.4                                | a,b,c               |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.902 | 0.103              | 1.7                                | c                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.895 | 0.047              | 1.7                                | c                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.863 | 0.049              | 1.5                                | b,c                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.868 | 0.046              | 1.6                                | c                   |
| Nemata (% of community)               | K-W                           | rank                | NO                                  | 0.237   | 2007                            | 3               | 0.0   | 0.0                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.0   | 0.0                | not calculable                     | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1.4   | 0.9                | not calculable                     | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.6   | 1.4                | not calculable                     | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1.5   | 3.4                | not calculable                     | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1.1   | 1.4                | not calculable                     | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.0   | 0.1                | not calculable                     | a                   |
| Hydracarina (% of community)          | K-W                           | rank                | YES                                 | 0.006   | 2007                            | 3               | 0.2   | 0.4                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.0   | 4.5                | 4.3                                | c                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 7.2   | 3.3                | 17.1                               | c                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 4.1   | 2.8                | 9.6                                | a,c                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.9   | 2.0                | 1.6                                | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.9   | 1.1                | 1.7                                | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.8   | 0.4                | 1.4                                | a,b                 |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | <0.001  | 2007                            | 3               | 96.7  | 5.8                | -                                  | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 88.6  | 5.0                | -1.4                               | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 86.1  | 6.3                | -1.8                               | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 71.4  | 11.7               | -4.4                               | c                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 81.3  | 8.0                | -2.7                               | a,c                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 96.5  | 1.5                | 0.0                                | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 95.5  | 2.5                | -0.2                               | b                   |
| Metal Sensitive Taxa (% of community) | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                            | 3               | 3.1   | 5.4                | -                                  | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 4.2   | 4.0                | 0.2                                | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 4.3   | 2.9                | 0.2                                | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 31.4  | 22.5               | 5.2                                | b,c                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 49.0  | 12.9               | 8.4                                | b                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 19.7  | 20.0               | 3.0                                | a,c                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 9.4   | 9.1                | 1.2                                | a,c                 |

**Table F.56: Statistical Comparison of Benthic Invertebrate Community Metrics at the Mary River Middle Mine-Exposed Area (E0-20) Among Years of Mine Operation (2015 to 2020) and Baseline (2011) for the Mary River Project CREMP**

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2011 | Pairwise Comparison |
| Tipulidae (% of community)              | K-W                           | rank                | NO                                  | 0.127   | 2007                            | 3               | 0.0  | 0.0                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 4.0  | 5.5                | not calculable                     | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 3.9  | 5.1                | not calculable                     | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 2.7  | 3.3                | not calculable                     | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 2.2  | 3.1                | not calculable                     | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.3  | 0.4                | not calculable                     | a                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 0.6  | 0.9                | not calculable                     | a                   |
| Collector-Gatherer FFG (% of community) | ANOVA                         | none                | YES                                 | <0.001  | 2007                            | 3               | 23.3 | 15.3               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 78.3 | 8.5                | 3.6                                | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 70.2 | 7.5                | 3.1                                | b,c                 |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 68.2 | 5.1                | 2.9                                | b,c                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 78.2 | 6.6                | 3.6                                | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 63.4 | 8.7                | 2.6                                | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 54.6 | 13.2               | 2.0                                | c                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.004   | 2007                            | 3               | 3.3  | 5.8                | -                                  | a,b,c               |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.0  | 0.0                | -0.6                               | b,c                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 0.4  | 0.8                | -0.5                               | c                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 17.0 | 7.1                | 2.4                                | d                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 9.2  | 8.5                | 1.0                                | a,d                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.7  | 0.8                | -0.5                               | b,c                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 4.6  | 4.2                | 0.2                                | a,b,d               |
| Shredder FFG (% of community)           | ANOVA                         | log10(x+1)          | YES                                 | <0.001  | 2007                            | 3               | 6.7  | 11.5               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 12.0 | 4.5                | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 7.7  | 6.3                | 0.1                                | a                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 7.0  | 4.1                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 11.7 | 8.2                | 0.4                                | a                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 32.4 | 5.5                | 2.2                                | b                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 15.8 | 9.4                | 0.8                                | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.57: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Lower Mine-Exposed (CO-05) Study Area, August 2020**

| Taxa                    | Study Area<br>Replicate Station | CO-05 (Lower Mine-Exposed) |    |     |     |    |
|-------------------------|---------------------------------|----------------------------|----|-----|-----|----|
|                         |                                 | B1                         | B2 | B3  | B4  | B5 |
| <hr/>                   |                                 |                            |    |     |     |    |
| <hr/>                   |                                 |                            |    |     |     |    |
| ROUNDWORMS              |                                 |                            |    |     |     |    |
| P. Nemata               |                                 | 4                          | 4  | 32  | 43  | 4  |
| ANNELIDS                |                                 |                            |    |     |     |    |
| P. Annelida             |                                 |                            |    |     |     |    |
| WORMS                   |                                 |                            |    |     |     |    |
| Cl. Oligochaeta         |                                 |                            |    |     |     |    |
| F. Enchytraeidae        |                                 | -                          | -  | 4   | 11  | 4  |
| ARTHROPODS              |                                 |                            |    |     |     |    |
| P. Arthropoda           |                                 |                            |    |     |     |    |
| MITES                   |                                 |                            |    |     |     |    |
| Cl. Arachnida           |                                 |                            |    |     |     |    |
| O. Acarina              |                                 |                            |    |     |     |    |
| F. Sperchonidae         |                                 |                            |    |     |     |    |
| Sperchon                |                                 | 50                         | 14 | 57  | 68  | 11 |
| SEED SHRIMPS            |                                 |                            |    |     |     |    |
| Cl. Ostracoda           |                                 | 4                          | 7  | -   | 4   | -  |
| SPRINGTAILS             |                                 |                            |    |     |     |    |
| Cl. Entognatha          |                                 |                            |    |     |     |    |
| O. Collembola           |                                 | -                          | -  | -   | -   | -  |
| INSECTS                 |                                 |                            |    |     |     |    |
| Cl. Insecta             |                                 |                            |    |     |     |    |
| MAYFLIES                |                                 |                            |    |     |     |    |
| O. Ephemeroptera        |                                 |                            |    |     |     |    |
| F. Baetidae             |                                 |                            |    |     |     |    |
| Acentrella feropagus    |                                 | -                          | 14 | -   | -   | -  |
| STONEFLIES              |                                 |                            |    |     |     |    |
| O. Plecoptera           |                                 |                            |    |     |     |    |
| F. Capniidae            |                                 |                            |    |     |     |    |
| immature                |                                 | -                          | -  | -   | -   | -  |
| TRUE FLIES              |                                 |                            |    |     |     |    |
| O. Diptera              |                                 |                            |    |     |     |    |
| BITING-MIDGE            |                                 |                            |    |     |     |    |
| F. Ceratopogonidae      |                                 |                            |    |     |     |    |
| indeterminate           |                                 | -                          | -  | -   | -   | -  |
| MIDGES                  |                                 |                            |    |     |     |    |
| F. Chironomidae         |                                 |                            |    |     |     |    |
| chironomid pupae        |                                 | 4                          | 4  | 4   | 14  | 4  |
| S.F. Chironominae       |                                 |                            |    |     |     |    |
| Micropsectra            |                                 | -                          | -  | 14  | -   | -  |
| Stictochironomus        |                                 | -                          | -  | 4   | -   | -  |
| S.F. Diamesinae         |                                 |                            |    |     |     |    |
| Diamesa                 |                                 | -                          | -  | -   | -   | -  |
| Pseudokiefferiella      |                                 | 29                         | 54 | 581 | 448 | 36 |
| S.F. Orthocladiinae     |                                 |                            |    |     |     |    |
| Cardiocladius           |                                 | 14                         | 22 | 14  | 14  | 7  |
| Chaetocladius           |                                 | -                          | -  | -   | -   | -  |
| Corynoneura             |                                 | -                          | -  | -   | -   | -  |
| Cricotopus              |                                 | 7                          | 11 | 143 | 341 | 18 |
| Cricotopus/Orthocladius |                                 | 4                          | 11 | 100 | 168 | 11 |
| Diplocladius            |                                 | -                          | -  | -   | -   | -  |
| Eukiefferiella          |                                 | -                          | -  | -   | -   | 4  |

**Table F.57: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for the Mary River Lower Mine-Exposed (CO-05) Study Area, August 2020**

| Taxa                                               | Study Area<br>Replicate Station | CO-05 (Lower Mine-Exposed) |       |       |       |       |
|----------------------------------------------------|---------------------------------|----------------------------|-------|-------|-------|-------|
|                                                    |                                 | B1                         | B2    | B3    | B4    | B5    |
| <i>Hydrobaenus</i>                                 |                                 | 11                         | 7     | -     | -     | -     |
| <i>Hydrosmitia</i>                                 |                                 | 7                          | -     | 190   | 61    | 14    |
| <i>Krenosmitia</i>                                 |                                 | 18                         | -     | -     | -     | 25    |
| <i>Limnophyes</i>                                  |                                 | -                          | -     | -     | -     | 4     |
| <i>Metriocnemus</i>                                |                                 | -                          | -     | -     | -     | -     |
| <i>Orthocladius (Euorthocladius)</i>               |                                 | -                          | 4     | 14    | -     | 7     |
| <i>Synorthocladius</i>                             |                                 | -                          | -     | -     | 79    | -     |
| <i>Tokunagaia</i>                                  |                                 | 7                          | -     | 14    | -     | 4     |
| <i>Tvetenia</i>                                    |                                 | 165                        | 122   | 638   | 434   | 86    |
| indeterminate                                      |                                 | -                          | -     | -     | -     | -     |
| <b>S.F. Tanypodinae</b>                            |                                 |                            |       |       |       |       |
| <i>Thienemannimyia</i> complex                     |                                 | 7                          | 7     | -     | 79    | 4     |
| <b>F. Empididae</b>                                |                                 |                            |       |       |       |       |
| <i>Clinocera</i>                                   |                                 | -                          | -     | -     | -     | -     |
| <b>F. Simuliidae</b>                               |                                 |                            |       |       |       |       |
| <i>Gymnopaia</i>                                   |                                 | -                          | -     | -     | -     | -     |
| <i>Metacnephia</i>                                 |                                 | 4                          | 11    | -     | -     | 7     |
| <i>Prosimulium</i>                                 |                                 | -                          | 22    | 7     | -     | 18    |
| <b>F. Tipulidae</b>                                |                                 |                            |       |       |       |       |
| <i>Dicranota</i>                                   |                                 | -                          | -     | 4     | -     | -     |
| <i>Ormosia</i>                                     |                                 | -                          | -     | -     | -     | -     |
| <i>Tipula</i>                                      |                                 | 7                          | 7     | 18    | -     | 4     |
| <b>Density (No. organisms per m<sup>2</sup>)</b>   |                                 | 341                        | 319   | 1,839 | 1,763 | 269   |
| <b>Richness (total number of taxa)<sup>a</sup></b> |                                 | 14                         | 14    | 15    | 11    | 17    |
| <b>Simpson's Evenness (E)</b>                      |                                 | 0.777                      | 0.861 | 0.804 | 0.859 | 0.897 |
| <b>Shannon-Wiener Diversity</b>                    |                                 | 2.630                      | 2.980 | 2.430 | 2.520 | 3.290 |
| <b>Dominant Group Composition</b>                  |                                 |                            |       |       |       |       |
| % Nemata                                           |                                 | 1.1                        | 1.1   | 1.8   | 2.4   | 1.3   |
| % Oligochaeta                                      |                                 | 0.0                        | 0.0   | 0.2   | 0.6   | 1.3   |
| % Hydracarina                                      |                                 | 14.7                       | 4.5   | 3.1   | 3.9   | 4.0   |
| % Ephemeroptera                                    |                                 | 0.0                        | 4.5   | 0.0   | 0.0   | 0.0   |
| % Ostracods                                        |                                 | 1.1                        | 2.3   | 0.0   | 0.2   | 0.0   |
| % Chironomids                                      |                                 | 80.0                       | 75.3  | 93.4  | 92.9  | 82.7  |
| % Metal Sensitive Chironmids                       |                                 | 8.5                        | 17.1  | 32.4  | 25.6  | 13.6  |
| % Simuliidae                                       |                                 | 1.1                        | 10.1  | 0.4   | 0.0   | 9.3   |
| % Tipulidae                                        |                                 | 2.1                        | 2.3   | 1.2   | 0.0   | 1.3   |
| <b>Functional Feeding Group Composition</b>        |                                 |                            |       |       |       |       |
| % Collector - Gatherers                            |                                 | 72.5                       | 68.0  | 81.0  | 61.7  | 71.6  |
| % Filterers                                        |                                 | 1.1                        | 10.1  | 1.2   | 0.0   | 9.3   |
| % Shredders                                        |                                 | 5.3                        | 8.2   | 13.8  | 29.1  | 11.0  |
| <b>Habitat Preference Group Composition</b>        |                                 |                            |       |       |       |       |
| % Clingers                                         |                                 | 19.0                       | 20.6  | 17.1  | 33.0  | 23.0  |
| % Sprawlers                                        |                                 | 73.6                       | 69.2  | 79.0  | 63.1  | 70.3  |
| % Burrowers                                        |                                 | 7.4                        | 10.2  | 3.9   | 3.9   | 6.7   |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.58:** Statistical Comparison of Benthic Metrics at the Mary River Lower Mine-Exposed Area (C0-05) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP

| Metric                                | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |       |                    |                        |                        |                     |
|---------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|-------|--------------------|------------------------|------------------------|---------------------|
|                                       | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean  | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                       |                               |                     |                                     |         |                                 |                 |       |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Density (No. per m <sup>2</sup> )     | ANOVA                         | none                | YES                                 | 0.059   | 2006                            | 3               | 311   | 230                | -                      | -0.4                   | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 491   | 455                | 0.8                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 234   | 168                | -0.3                   | -0.6                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1,161 | 584                | 3.7                    | 1.5                    | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 1,214 | 654                | 3.9                    | 1.6                    | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1,391 | 1,083              | 4.7                    | 2.0                    | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 1,470 | 693                | 5.0                    | 2.2                    | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 906   | 818                | 2.6                    | 0.9                    | a                   |
| Richness (No. of Taxa)                | ANOVA                         | log10               | YES                                 | <0.001  | 2006                            | 3               | 10.7  | 3.8                | -                      | -2.1                   | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 19.0  | 4.0                | 2.2                    | -                      | b,c,d               |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 13.2  | 2.7                | 0.7                    | -1.5                   | ac                  |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 19.6  | 3.3                | 2.4                    | 0.2                    | b,d                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 22.0  | 3.2                | 3.0                    | 0.8                    | b                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 18.6  | 0.9                | 2.1                    | -0.1                   | b,d                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 15.8  | 2.9                | 1.4                    | -0.8                   | b,c,d               |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 14.2  | 2.2                | 0.9                    | -1.2                   | a,c,d               |
| Simpson's Evenness                    | K-W                           | rank                | YES                                 | 0.003   | 2006                            | 3               | 0.668 | 0.022              | -                      | -2.7                   | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 0.879 | 0.079              | 9.8                    | -                      | b,c                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 0.923 | 0.038              | 11.8                   | 0.6                    | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 0.849 | 0.015              | 8.4                    | -0.4                   | b,c                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 0.798 | 0.161              | 6.0                    | -1.0                   | a,c,d               |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.675 | 0.149              | 0.4                    | -2.6                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.716 | 0.092              | 2.3                    | -2.1                   | a,d                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 0.839 | 0.048              | 7.9                    | -0.5                   | c,d                 |
| Nemata (% of community)               | ANOVA                         | log10(x+1)          | YES                                 | 0.043   | 2006                            | 3               | 0.2   | 0.4                | -                      | -0.5                   | a,b                 |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 1.6   | 2.7                | 3.2                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.0   | 4.5                | 4.3                    | 0.2                    | a,b                 |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1.0   | 1.0                | 1.9                    | -0.2                   | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 2.1   | 1.6                | 4.5                    | 0.2                    | a,b                 |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 2.1   | 1.9                | 4.6                    | 0.2                    | a,b                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.6   | 0.3                | 0.9                    | -0.4                   | b                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 1.5   | 0.6                | 3.1                    | 0.0                    | a,b                 |
| Hydracarina (% of community)          | K-W                           | rank                | YES                                 | 0.02    | 2006                            | 3               | 0.5   | 0.4                | -                      | 3.6                    | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 0.1   | 0.1                | -1.0                   | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 2.0   | 4.5                | 3.7                    | 16.9                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 5.5   | 3.9                | 12.2                   | 47.8                   | b                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 3.9   | 4.7                | 8.2                    | 33.2                   | a,b,c               |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 1.5   | 2.3                | 2.4                    | 12.3                   | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 2.0   | 1.1                | 3.6                    | 16.9                   | a,c                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 6.0   | 4.9                | 13.4                   | 52.3                   | b,c                 |
| Chironomidae (% of community)         | ANOVA                         | none                | YES                                 | <0.001  | 2006                            | 3               | 99.0  | 0.8                | -                      | 90.4                   | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 90.0  | 0.1                | -10.9                  | -                      | a,b                 |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 80.4  | 11.4               | -22.4                  | -95.8                  | b                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 87.8  | 3.0                | -13.5                  | -21.7                  | a,b                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 63.8  | 12.6               | -42.5                  | -262.1                 | c                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 85.6  | 7.0                | -16.2                  | -44.2                  | a,b                 |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 95.1  | 1.8                | -4.8                   | 50.7                   | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 84.8  | 8.0                | -17.2                  | -52.0                  | a,b                 |
| Metal Sensitive Taxa (% of community) | ANOVA                         | none                | YES                                 | <0.001  | 2006                            | 3               | 37.2  | 16.0               | -                      | 2.2                    | a,b,c               |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 14.4  | 10.4               | -1.4                   | -                      | c                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 15.9  | 11.5               | -1.3                   | 0.1                    | c                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 29.2  | 13.6               | -0.5                   | 1.4                    | b,c                 |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 39.0  | 23.3               | 0.1                    | 2.4                    | a,b,c               |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 59.6  | 11.3               | 1.4                    | 4.3                    | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 49.3  | 16.6               | 0.8                    | 3.4                    | a,b                 |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 19.4  | 9.6                | -1.1                   | 0.5                    | c                   |
| Tipulidae (% of community)            | K-W                           | rank                | NO                                  | 0.121   | 2006                            | 3               | 0.0   | 0.1                | -                      | 0.0                    | a                   |
|                                       |                               |                     |                                     |         | 2007                            | 3               | 0.0   | 0.1                | 0.0                    | -                      | a                   |
|                                       |                               |                     |                                     |         | 2015                            | 5               | 6.0   | 8.9                | 60.0                   | 60.0                   | a                   |
|                                       |                               |                     |                                     |         | 2016                            | 5               | 1.7   | 1.2                | 17.1                   | 17.1                   | a                   |
|                                       |                               |                     |                                     |         | 2017                            | 5               | 1.1   | 1.6                | 11.0                   | 11.0                   | a                   |
|                                       |                               |                     |                                     |         | 2018                            | 5               | 0.6   | 0.5                | 6.1                    | 6.1                    | a                   |
|                                       |                               |                     |                                     |         | 2019                            | 5               | 0.5   | 0.5                | 5.3                    | 5.3                    | a                   |
|                                       |                               |                     |                                     |         | 2020                            | 5               | 1.4   | 0.9                | 13.7                   | 13.7                   | a                   |

**Table F.58: Statistical Comparison of Benthic Metrics at the Mary River Lower Mine-Exposed Area (C0-05) Among Years of Mine Operation (2015 to 2020) and Baseline (2007, 2011) for the Mary River Project CREMP**

| Metric                                  | Overall 8-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons |                 |      |                    |                        |                        |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|---------------------------------|-----------------|------|--------------------|------------------------|------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                            | Sample Size (n) | Mean | Standard Deviation | Effect Size            |                        | Pairwise Comparison |
|                                         |                               |                     |                                     |         |                                 |                 |      |                    | vs. Baseline Year 2007 | vs. Baseline Year 2011 |                     |
| Collector-Gatherer FFG (% of community) | ANOVA                         | log10               | YES                                 | <0.001  | 2006                            | 3               | 35.0 | 15.3               | -                      | -2.7                   | a                   |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 66.7 | 11.5               | 2.1                    | -                      | b                   |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 82.9 | 13.0               | 3.1                    | 1.4                    | b                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 59.0 | 10.2               | 1.6                    | -0.7                   | b                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 63.9 | 13.5               | 1.9                    | -0.2                   | b                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 83.7 | 8.2                | 3.2                    | 1.5                    | b                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 67.0 | 15.7               | 2.1                    | 0.0                    | b                   |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 71.0 | 7.0                | 2.4                    | 0.4                    | b                   |
| Filterer FFG (% of community)           | K-W                           | rank                | YES                                 | 0.002   | 2006                            | 3               | 21.0 | 28.3               | -                      | 0.7                    | a,b,c               |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 13.3 | 11.5               | -0.3                   | -                      | a,b                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 0.0  | 0.0                | -0.7                   | -1.2                   | d                   |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 0.6  | 0.7                | -0.7                   | -1.1                   | d                   |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 19.9 | 10.4               | 0.0                    | 0.6                    | a                   |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 6.1  | 4.2                | -0.5                   | -0.6                   | a,b                 |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 0.9  | 0.7                | -0.7                   | -1.1                   | c,d                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 4.3  | 5.0                | -0.6                   | -0.8                   | b,c,d               |
| Shredder FFG (% of community)           | ANOVA                         | log10               | YES                                 | 0.001   | 2006                            | 3               | 40.2 | 20.9               | -                      | 5.8                    | a                   |
|                                         |                               |                     |                                     |         | 2007                            | 3               | 6.7  | 5.8                | -1.6                   | -                      | b,c                 |
|                                         |                               |                     |                                     |         | 2015                            | 5               | 16.0 | 11.4               | -1.2                   | 1.6                    | a,b                 |
|                                         |                               |                     |                                     |         | 2016                            | 5               | 8.9  | 6.8                | -1.5                   | 0.4                    | a,b,c               |
|                                         |                               |                     |                                     |         | 2017                            | 5               | 6.7  | 3.1                | -1.6                   | 0.01                   | b,c                 |
|                                         |                               |                     |                                     |         | 2018                            | 5               | 4.2  | 2.5                | -1.7                   | -0.4                   | c                   |
|                                         |                               |                     |                                     |         | 2019                            | 5               | 18.0 | 3.5                | -1.1                   | 2.0                    | a,b                 |
|                                         |                               |                     |                                     |         | 2020                            | 5               | 13.5 | 9.3                | -1.3                   | 1.2                    | a,b,c               |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of a ± 2 SD effect size of respective baseline year mean indicating an ecologically meaningful difference between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.59: Statistical Comparison of Sediment Physical Properties Between Mary Lake (BL0) and Reference Lake 3 Stations Collected at Littoral and Profundal Depths, Mary River Project CREMP, August 2020**

| Lake Zone                   | Sediment Variable                      | Statistical Test Results      |                     |                                       |         | Summary Statistics |                 |       |                    |                |         |         |
|-----------------------------|----------------------------------------|-------------------------------|---------------------|---------------------------------------|---------|--------------------|-----------------|-------|--------------------|----------------|---------|---------|
|                             |                                        | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference between Areas? | P-value | Study Lake         | Sample Size (n) | Mean  | Standard Deviation | Standard Error | Minimum | Maximum |
| Littoral (Shallow) Stations | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.926   | Reference          | 5               | 29.6  | 7.52               | 3.36           | 23.4    | 40.4    |
|                             |                                        |                               |                     |                                       |         | Mary               | 4               | 28.1  | 34.5               | 15.4           | 5.20    | 78.6    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.459   | Reference          | 5               | 62.2  | 6.33               | 2.83           | 53.4    | 68.4    |
|                             |                                        |                               |                     |                                       |         | Mary               | 4               | 53.6  | 24.0               | 10.7           | 18.0    | 69.9    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.166   | Reference          | 5               | 8.22  | 3.00               | 1.34           | 6.20    | 13.4    |
|                             |                                        |                               |                     |                                       |         | Mary               | 4               | 18.3  | 14.5               | 6.48           | 3.40    | 32.0    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.005   | Reference          | 5               | 87.9  | 4.60               | 2.06           | 80.2    | 92.3    |
|                             |                                        |                               |                     |                                       |         | Mary               | 4               | 50.7  | 19.9               | 8.91           | 27.3    | 67.3    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | 0.005   | Reference          | 5               | 4.80  | 1.96               | 0.876          | 2.26    | 6.95    |
|                             |                                        |                               |                     |                                       |         | Mary               | 4               | 0.765 | 0.450              | 0.201          | 0.220   | 1.31    |
| Profundal (Deep) Stations   | Sand-Sized Material (%)                | tequal                        | none                | NO                                    | 0.920   | Reference          | 5               | 31.6  | 22.3               | 10.0           | 13.9    | 56.6    |
|                             |                                        |                               |                     |                                       |         | Mary               | 6               | 29.9  | 30.9               | 13.8           | 7.70    | 91.9    |
|                             | Silt-Sized Material (%)                | tequal                        | none                | NO                                    | 0.608   | Reference          | 5               | 57.4  | 18.1               | 8.10           | 36.9    | 71.9    |
|                             |                                        |                               |                     |                                       |         | Mary               | 6               | 50.4  | 24.4               | 10.9           | 6.00    | 73.4    |
|                             | Clay-Sized Material (%)                | tequal                        | none                | NO                                    | 0.149   | Reference          | 5               | 11.0  | 4.28               | 1.92           | 6.30    | 15.1    |
|                             |                                        |                               |                     |                                       |         | Mary               | 6               | 19.7  | 11.6               | 5.19           | 2.10    | 33.2    |
|                             | Moisture (%)                           | tequal                        | none                | YES                                   | 0.004   | Reference          | 5               | 82.6  | 3.60               | 1.61           | 78.3    | 86.6    |
|                             |                                        |                               |                     |                                       |         | Mary               | 6               | 49.7  | 18.9               | 8.46           | 16.6    | 68.4    |
|                             | Total Organic Carbon (TOC) Content (%) | tequal                        | none                | YES                                   | <0.001  | Reference          | 5               | 3.42  | 1.08               | 0.484          | 2.20    | 4.52    |
|                             |                                        |                               |                     |                                       |         | Mary               | 6               | 0.688 | 0.275              | 0.123          | 0.220   | 0.930   |

Highlighted values indicate significant difference between study areas based on statistical p-value less than 0.10.

<sup>a</sup> Statistical tests included tequal (t-test assuming equal variance), tunequal (t-test assuming unequal variance), and M-W (Mann-Whitney U-test).



**Table F.60: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary Lake, August 2020**

| Taxa                         | Study Area        | Mary Lake - Littoral Stations |        |       |       | Mary Lake - Profundal Stations |        |        |        |       |       |
|------------------------------|-------------------|-------------------------------|--------|-------|-------|--------------------------------|--------|--------|--------|-------|-------|
|                              | Replicate Station | BLO-1                         | BLO-11 | BLO-7 | BLO-6 | BLO-3                          | BLO-15 | BLO-14 | BLO-13 | BLO-4 | BLO-5 |
| ROUNDWORMS                   |                   |                               |        |       |       |                                |        |        |        |       |       |
| P. Nemata                    |                   | -                             | 86     | -     | 34    | 14                             | -      | -      | -      | -     | 34    |
| ANNELIDS                     |                   |                               |        |       |       |                                |        |        |        |       |       |
| P. Annelida                  |                   |                               |        |       |       |                                |        |        |        |       |       |
| WORMS                        |                   |                               |        |       |       |                                |        |        |        |       |       |
| Cl. Oligochaeta              |                   |                               |        |       |       |                                |        |        |        |       |       |
| F. Enchytraeidae             |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| F. Lumbriculidae             |                   |                               |        |       |       |                                |        |        |        |       |       |
| Lumbriculus                  |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| ARTHROPODS                   |                   |                               |        |       |       |                                |        |        |        |       |       |
| P. Arthropoda                |                   |                               |        |       |       |                                |        |        |        |       |       |
| MITES                        |                   |                               |        |       |       |                                |        |        |        |       |       |
| Cl. Arachnida                |                   |                               |        |       |       |                                |        |        |        |       |       |
| O. Acarina                   |                   |                               |        |       |       |                                |        |        |        |       |       |
| immature                     |                   | -                             | 17     | -     | -     | -                              | -      | -      | -      | -     | -     |
| F. Acalyptonotidae           |                   |                               |        |       |       |                                |        |        |        |       |       |
| Acalyptonotus                |                   | 60                            | 34     | 86    | 34    | -                              | 17     | 17     | 17     | 17    | 17    |
| F. Hygrobatidae              |                   |                               |        |       |       |                                |        |        |        |       |       |
| Hygrobates                   |                   | 17                            | 52     | -     | -     | 14                             | -      | -      | -      | -     | 17    |
| F. Lebertiidae               |                   |                               |        |       |       |                                |        |        |        |       |       |
| Lebertia                     |                   | 9                             | 34     | -     | -     | 43                             | -      | -      | 9      | 17    | -     |
| F. Sperchontidae             |                   |                               |        |       |       |                                |        |        |        |       |       |
| Sperchon                     |                   | -                             | 17     | -     | -     | -                              | -      | -      | -      | -     | -     |
| HARPACTICIDS                 |                   |                               |        |       |       |                                |        |        |        |       |       |
| O. Harpacticoida             |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| SEED SHRIMPS                 |                   |                               |        |       |       |                                |        |        |        |       |       |
| Cl. Ostracoda                |                   | 1,172                         | 4,741  | 526   | 474   | 417                            | 164    | 17     | 155    | 17    | 17    |
| INSECTS                      |                   |                               |        |       |       |                                |        |        |        |       |       |
| Cl. Insecta                  |                   |                               |        |       |       |                                |        |        |        |       |       |
| CADDISFLIES                  |                   |                               |        |       |       |                                |        |        |        |       |       |
| O. Trichoptera               |                   |                               |        |       |       |                                |        |        |        |       |       |
| F. Apataniidae               |                   |                               |        |       |       |                                |        |        |        |       |       |
| Apatania                     |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| F. Limnephilidae             |                   |                               |        |       |       |                                |        |        |        |       |       |
| Grensia praeterita           |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| TRUE FLIES                   |                   |                               |        |       |       |                                |        |        |        |       |       |
| O. Diptera                   |                   |                               |        |       |       |                                |        |        |        |       |       |
| MIDGES                       |                   |                               |        |       |       |                                |        |        |        |       |       |
| F. Chironomidae              |                   |                               |        |       |       |                                |        |        |        |       |       |
| chironomid pupae             |                   | 17                            | 17     | -     | -     | 14                             | -      | -      | -      | 9     | 69    |
| S.F. Chironominae            |                   |                               |        |       |       |                                |        |        |        |       |       |
| Chironomus                   |                   | -                             | 86     | -     | -     | -                              | -      | -      | -      | -     | 397   |
| Micropsectra                 |                   | 422                           | 241    | -     | -     | 172                            | 9      | -      | -      | -     | 17    |
| Paratanytarsus               |                   | 86                            | 34     | -     | -     | -                              | -      | -      | -      | -     | -     |
| Sergentia                    |                   | -                             | 34     | -     | -     | -                              | -      | -      | -      | -     | 362   |
| Stictochironomus             |                   | 250                           | 2,414  | -     | -     | -                              | -      | -      | -      | -     | 310   |
| Tanytarsus                   |                   | 353                           | 121    | -     | -     | -                              | -      | -      | -      | -     | -     |
| S.F. Diamesinae              |                   |                               |        |       |       |                                |        |        |        |       |       |
| Diamesa                      |                   | 17                            | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| Protanypus                   |                   | -                             | 69     | 26    | 26    | 14                             | 9      | 26     | 17     | -     | 17    |
| Pseudodiamesa                |                   | -                             | -      | 17    | 26    | -                              | -      | 9      | -      | -     | -     |
| S.F. Orthocladiinae          |                   |                               |        |       |       |                                |        |        |        |       |       |
| Abiskomyia                   |                   | 138                           | 948    | 9     | 26    | 14                             | 9      | -      | -      | -     | 34    |
| Heterotrissocladius          |                   | 103                           | 328    | 207   | 138   | 517                            | -      | 500    | 388    | 466   | -     |
| Hydrobaenus                  |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | 17    |
| Mesocricotopus               |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| Paracladius                  |                   | 17                            | 69     | -     | 9     | -                              | -      | -      | -      | -     | -     |
| Parakiefferiella             |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| Psectrocladius               |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| Zalutschia                   |                   | 17                            | -      | -     | -     | 57                             | -      | -      | -      | -     | -     |
| Orthocladiinae indeterminate |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| S.F. Tanypodinae             |                   |                               |        |       |       |                                |        |        |        |       |       |
| Arctopelopia                 |                   | -                             | -      | -     | -     | -                              | -      | -      | -      | -     | -     |
| Procladius                   |                   | 2,241                         | -      | 241   | 198   | 14                             | 9      | 69     | 26     | 26    | 52    |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.60: Benthic Invertebrate Community Data, Expressed in Number of Organisms per Square Metre, for Mary Lake, August 2020**

| Taxa                                         | Study Area        | Mary Lake - Littoral Stations |        |       |       | Mary Lake - Profundal Stations |        |        |        |       |       |
|----------------------------------------------|-------------------|-------------------------------|--------|-------|-------|--------------------------------|--------|--------|--------|-------|-------|
|                                              | Replicate Station | BLO-1                         | BLO-11 | BLO-7 | BLO-6 | BLO-3                          | BLO-15 | BLO-14 | BLO-13 | BLO-4 | BLO-5 |
| Density (No. organisms per m <sup>2</sup> )  |                   | 4,922                         | 9,345  | 1,112 | 966   | 1,298                          | 216    | 641    | 1,368  | 615   | 554   |
| Richness (total number of taxa) <sup>a</sup> |                   | 14                            | 16     | 7     | 9     | 10                             | 6      | 6      | 12     | 6     | 5     |
| Simpson's Evenness (E)                       |                   | 0.772                         | 0.707  | 0.802 | 0.778 | 0.787                          | 0.492  | 0.445  | 0.834  | 0.637 | 0.322 |
| Shannon-Wiener Diversity                     |                   | 2.38                          | 2.14   | 2.00  | 2.20  | 2.17                           | 1.34   | 1.18   | 2.48   | 1.49  | 0.867 |
| Dominant Taxonomic Group Composition         |                   |                               |        |       |       |                                |        |        |        |       |       |
| % Nemata                                     |                   | 0                             | 0.923  | 0     | 3.57  | 1.11                           | 0      | 0      | 2.53   | 0     | 0     |
| % Hydracarina                                |                   | 1.75                          | 1.66   | 7.75  | 3.57  | 4.44                           | 8.00   | 2.70   | 2.53   | 4.23  | 6.25  |
| % Ostracods                                  |                   | 23.8                          | 50.7   | 47.3  | 49.1  | 32.2                           | 76.0   | 2.70   | 1.27   | 25.4  | 3.13  |
| % Chironomids                                |                   | 74.4                          | 46.7   | 45.0  | 43.8  | 62.2                           | 16.0   | 94.6   | 93.7   | 70.4  | 90.6  |
| % Metal Sensitive Chironomids                |                   | 17.9                          | 5.00   | 3.88  | 5.36  | 14.7                           | 8.00   | 5.41   | 2.68   | 2.82  | 0     |
| % Tipulidae                                  |                   |                               |        |       |       |                                |        |        |        |       |       |
| Functional Feeding Group Composition         |                   |                               |        |       |       |                                |        |        |        |       |       |
| % Collector - Gatherers                      |                   | 34.6                          | 94.1   | 70.5  | 75.9  | 76.3                           | 84.0   | 86.5   | 92.1   | 91.5  | 89.0  |
| % Filterers                                  |                   | 17.6                          | 4.26   | 0     | 0     | 13.6                           | 4.00   | 0      | 1.34   | 0     | 0     |
| % Shredders                                  |                   | 0.352                         | 0      | 0     | 0     | 4.53                           | 0      | 0      | 0      | 0     | 0     |
| Habitat Preference Group Composition         |                   |                               |        |       |       |                                |        |        |        |       |       |
| % Clingers                                   |                   | 17.6                          | 5.92   | 7.75  | 3.57  | 18.0                           | 12.0   | 2.70   | 32.0   | 4.23  | 6.25  |
| % Sprawlers                                  |                   | 77.3                          | 65.6   | 89.9  | 90.2  | 79.7                           | 84.0   | 93.2   | 9.29   | 93.0  | 93.8  |
| % Burrowers                                  |                   | 5.10                          | 28.5   | 2.33  | 6.25  | 2.24                           | 4.00   | 4.05   | 58.7   | 2.82  | 0     |

<sup>a</sup> Bold entries excluded from taxa count

**Table F.61:** Statistical Comparison of Benthic Invertebrate Community Metrics at Mary Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP

| Metric                                  | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )       | ANOVA                         | none                | NO                                  | 0.780   | 2007                                         | 3               | 2,667 | 1,454              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 2,453 | 2,186              | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 1,947 | 1,591              | -0.5                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 1,839 | 1,853              | -0.6                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 1,718 | 1,418              | -0.7                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 2,448 | 2,313              | -0.2                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 4,086 | 3,955              | 1.0                                | a                   |
| Richness (No. of Taxa)                  | ANOVA                         | log10               | NO                                  | 0.668   | 2007                                         | 3               | 8.0   | 2.0                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 9.0   | 1.8                | 0.5                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 8.7   | 0.5                | 0.3                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 9.5   | 2.1                | 0.8                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 9.3   | 2.2                | 0.6                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 11.5  | 5.0                | 1.8                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 11.5  | 4.2                | 1.8                                | a                   |
| Simpson's Evenness                      | ANOVA                         | none                | NO                                  | 0.411   | 2007                                         | 3               | 0.718 | 0.041              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 0.761 | 0.058              | 1.1                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 0.574 | 0.299              | -3.5                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 0.818 | 0.110              | 2.4                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 0.575 | 0.293              | -3.5                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 0.663 | 0.169              | -1.3                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 0.765 | 0.041              | 1.2                                | a                   |
| Nemata (% of community)                 | K-W                           | rank                | NO                                  | 0.708   | 2007                                         | 3               | 7.3   | 11.2               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 5.6   | 6.3                | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 3.6   | 7.5                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 3.5   | 6.2                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 3.5   | 6.4                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 2.4   | 2.4                | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 1.1   | 1.7                | -0.6                               | a                   |
| Ostracoda (% of community)              | K-W                           | rank                | YES                                 | 0.020   | 2007                                         | 3               | 0.2   | 0.4                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 1.9   | 2.2                | 4.3                                | ab                  |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 2.3   | 2.2                | 5.5                                | ab                  |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 2.1   | 2.2                | 5.0                                | ab                  |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 8.9   | 10.9               | 22.8                               | bc                  |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 2.0   | 1.1                | 4.8                                | ab                  |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 42.7  | 12.7               | 112.4                              | c                   |
| Chironomidae (% of community)           | K-W                           | rank                | YES                                 | 0.013   | 2007                                         | 3               | 90.8  | 11.8               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 91.1  | 7.7                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 90.6  | 12.2               | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 85.7  | 13.1               | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 86.2  | 18.7               | -0.4                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 93.4  | 4.0                | 0.2                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 52.5  | 14.7               | -3.2                               | b                   |
| Metal Sensitive Taxa (% of community)   | ANOVA                         | log10               | NO                                  | 0.654   | 2007                                         | 3               | 22.4  | 13.8               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 15.8  | 14.6               | -0.5                               | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 19.2  | 13.3               | -0.2                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 21.3  | 7.7                | -0.1                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 11.6  | 9.8                | -0.8                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 14.2  | 12.2               | -0.6                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 8.1   | 6.6                | -1.0                               | a                   |
| Collector-Gatherer FFG (% of community) | K-W                           | rank                | NO                                  | 0.641   | 2007                                         | 3               | 66.0  | 26.7               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 4               | 72.8  | 23.1               | 0.3                                | a                   |
|                                         |                               |                     |                                     |         | 2016                                         | 6               | 73.5  | 24.7               | 0.3                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 4               | 52.2  | 23.6               | -0.5                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 4               | 76.1  | 36.4               | 0.4                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 4               | 65.1  | 24.9               | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 4               | 68.8  | 24.9               | 0.1                                | a                   |

**Table F.61: Statistical Comparison of Benthic Invertebrate Community Metrics at Mary Lake Littoral (Shallow) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                        | Overall 7-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |      |                    |                                    |                     |
|-------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|------|--------------------|------------------------------------|---------------------|
|                               | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Filterer FFG (% of community) | K-W                           | rank                | NO                                  | 0.544   | 2007                                         | 3               | 22.0 | 14.5               | -                                  | a                   |
|                               |                               |                     |                                     |         | 2015                                         | 4               | 14.4 | 16.2               | -0.5                               | a                   |
|                               |                               |                     |                                     |         | 2016                                         | 6               | 12.4 | 13.2               | -0.7                               | a                   |
|                               |                               |                     |                                     |         | 2017                                         | 4               | 13.3 | 16.0               | -0.6                               | a                   |
|                               |                               |                     |                                     |         | 2018                                         | 4               | 4.1  | 7.3                | -1.2                               | a                   |
|                               |                               |                     |                                     |         | 2019                                         | 4               | 11.5 | 13.8               | -0.7                               | a                   |
|                               |                               |                     |                                     |         | 2020                                         | 4               | 5.5  | 8.3                | -1.1                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**Table F.62: Statistical Comparison of Benthic Invertebrate Community Metrics at Mary Lake Profundal (Deep) Stations Among Years of Mine Operation (2015 to 2020) and Baseline (2007) for the Mary River Project CREMP**

| Metric                                  | Overall 6-Year Comparison     |                     |                                     |         | Pair-wise, post-hoc comparisons <sup>a</sup> |                 |       |                    |                                    |                     |
|-----------------------------------------|-------------------------------|---------------------|-------------------------------------|---------|----------------------------------------------|-----------------|-------|--------------------|------------------------------------|---------------------|
|                                         | Statistical Test <sup>a</sup> | Data Transformation | Significant Difference Among Years? | P-value | Year                                         | Sample Size (n) | Mean  | Standard Deviation | Effect Size vs. Baseline Year 2007 | Pairwise Comparison |
| Density (No. per m <sup>2</sup> )       | ANOVA                         | log10               | YES                                 | 0.005   | 2007                                         | 4               | 3,512 | 3,257              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 775   | 748                | -0.8                               | bc                  |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 536   | 497                | -0.9                               | c                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 1,521 | 599                | -0.6                               | ab                  |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 1,428 | 506                | -0.6                               | ab                  |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 779   | 452                | -0.8                               | abc                 |
| Richness (No. of Taxa)                  | ANOVA                         | log10               | NO                                  | 0.992   | 2007                                         | 4               | 8.0   | 6.2                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 7.7   | 4.1                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 7.0   | 1.5                | -0.2                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 8.2   | 4.4                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 8.2   | 4.5                | 0.0                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 7.5   | 2.8                | -0.1                               | a                   |
| Simpson's Evenness                      | ANOVA                         | log10               | NO                                  | 0.161   | 2007                                         | 4               | 0.453 | 0.268              | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 0.696 | 0.142              | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 0.604 | 0.236              | 0.6                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 0.387 | 0.359              | -0.2                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 0.479 | 0.273              | 0.1                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 0.586 | 0.201              | 0.5                                | a                   |
| Nemata (% of community)                 | K-W                           | rank                | NO                                  | 0.417   | 2007                                         | 4               | 1.3   | 1.8                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 2.0   | 2.6                | 0.4                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 2.4   | 1.9                | 0.6                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 1.7   | 1.9                | 0.2                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 0.7   | 0.9                | -0.3                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 0.6   | 1.0                | -0.4                               | a                   |
| Ostracoda (% of community)              | K-W                           | rank                | NO                                  | 0.215   | 2007                                         | 4               | 1.6   | 2.2                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 11.1  | 10.9               | 4.4                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 3.2   | 6.2                | 0.7                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 3.5   | 3.2                | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 10.9  | 17.4               | 4.3                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 23.4  | 28.9               | 10.0                               | a                   |
| Chironomidae (% of community)           | K-W                           | rank                | NO                                  | 0.254   | 2007                                         | 4               | 96.4  | 4.7                | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 83.8  | 12.2               | -2.7                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 84.9  | 13.8               | -2.5                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 93.8  | 4.1                | -0.6                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 86.6  | 17.4               | -2.1                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 71.3  | 30.2               | -5.4                               | a                   |
| Metal Sensitive Taxa (% of community)   | K-W                           | rank                | NO                                  | 0.522   | 2007                                         | 4               | 33.7  | 27.9               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 9.5   | 8.2                | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 5.6   | 3.2                | -1.0                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 8.6   | 11.2               | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 4.5   | 4.5                | -1.1                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 5.6   | 5.2                | -1.0                               | a                   |
| Collector-Gatherer FFG (% of community) | K-W                           | rank                | NO                                  | 0.142   | 2007                                         | 4               | 64.4  | 27.7               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 82.7  | 5.9                | 0.7                                | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 80.7  | 18.2               | 0.6                                | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 90.0  | 13.2               | 0.9                                | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 92.3  | 4.2                | 1.0                                | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 86.6  | 5.9                | 0.8                                | a                   |
| Filterer FFG (% of community)           | K-W                           | rank                | NO                                  | 0.230   | 2007                                         | 4               | 33.1  | 27.8               | -                                  | a                   |
|                                         |                               |                     |                                     |         | 2015                                         | 6               | 9.4   | 7.9                | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2017                                         | 6               | 3.8   | 2.7                | -1.1                               | a                   |
|                                         |                               |                     |                                     |         | 2018                                         | 6               | 7.8   | 11.4               | -0.9                               | a                   |
|                                         |                               |                     |                                     |         | 2019                                         | 6               | 2.9   | 4.1                | -1.1                               | a                   |
|                                         |                               |                     |                                     |         | 2020                                         | 6               | 3.2   | 5.3                | -1.1                               | a                   |

Indicates a statistically significant difference for respective comparison (p-value ≤ 0.1).

Indicates magnitude of difference outside of the Critical Effect Size of ± 2 SD of respective baseline year mean, suggesting an ecologically meaningful difference in endpoint value between study years.

Note: "-" indicates not applicable.

<sup>a</sup> Statistical tests include Analysis of Variance (ANOVA) followed by Tukey's Honestly Significant Difference (HSD) post hoc tests, or Kruskal-Wallis H-test (K-W) followed by Mann-Whitney U-test (M-W).

**APPENDIX G**

**FISH POPULATION SURVEY DATA**

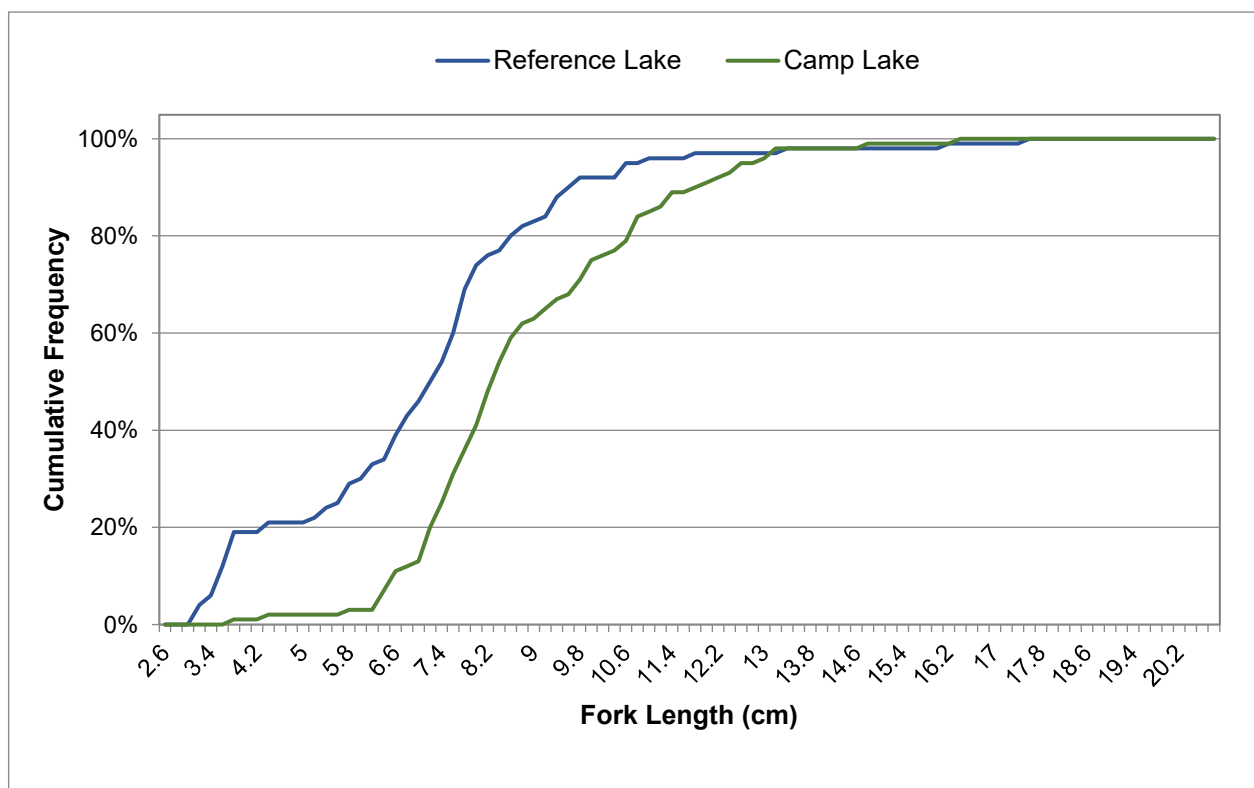


**Figure G.1: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Camp Lake and Reference Lake 3, Mary River Project CREMP, August 2020**



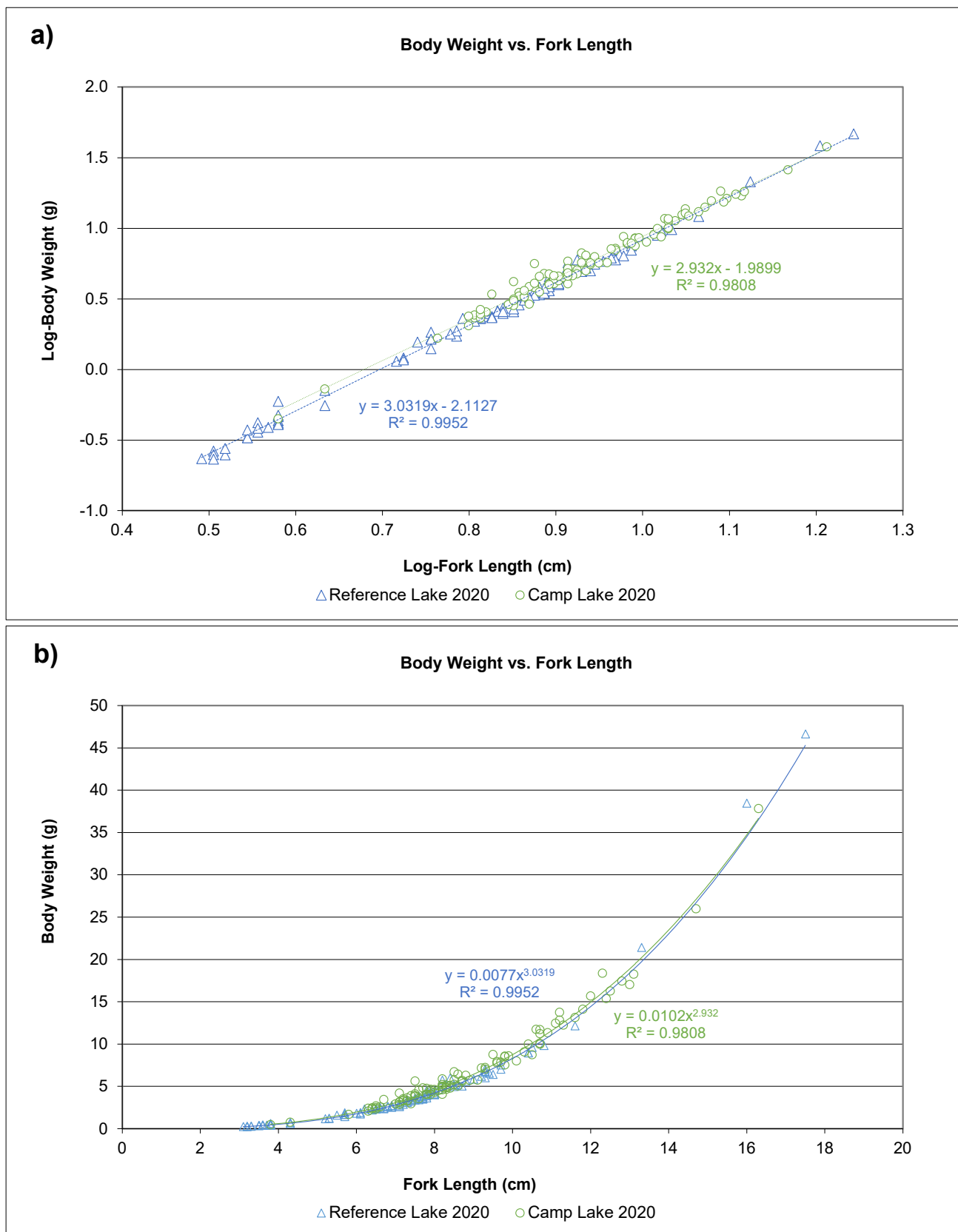


**Figure G.2:** Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Camp Lake and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data



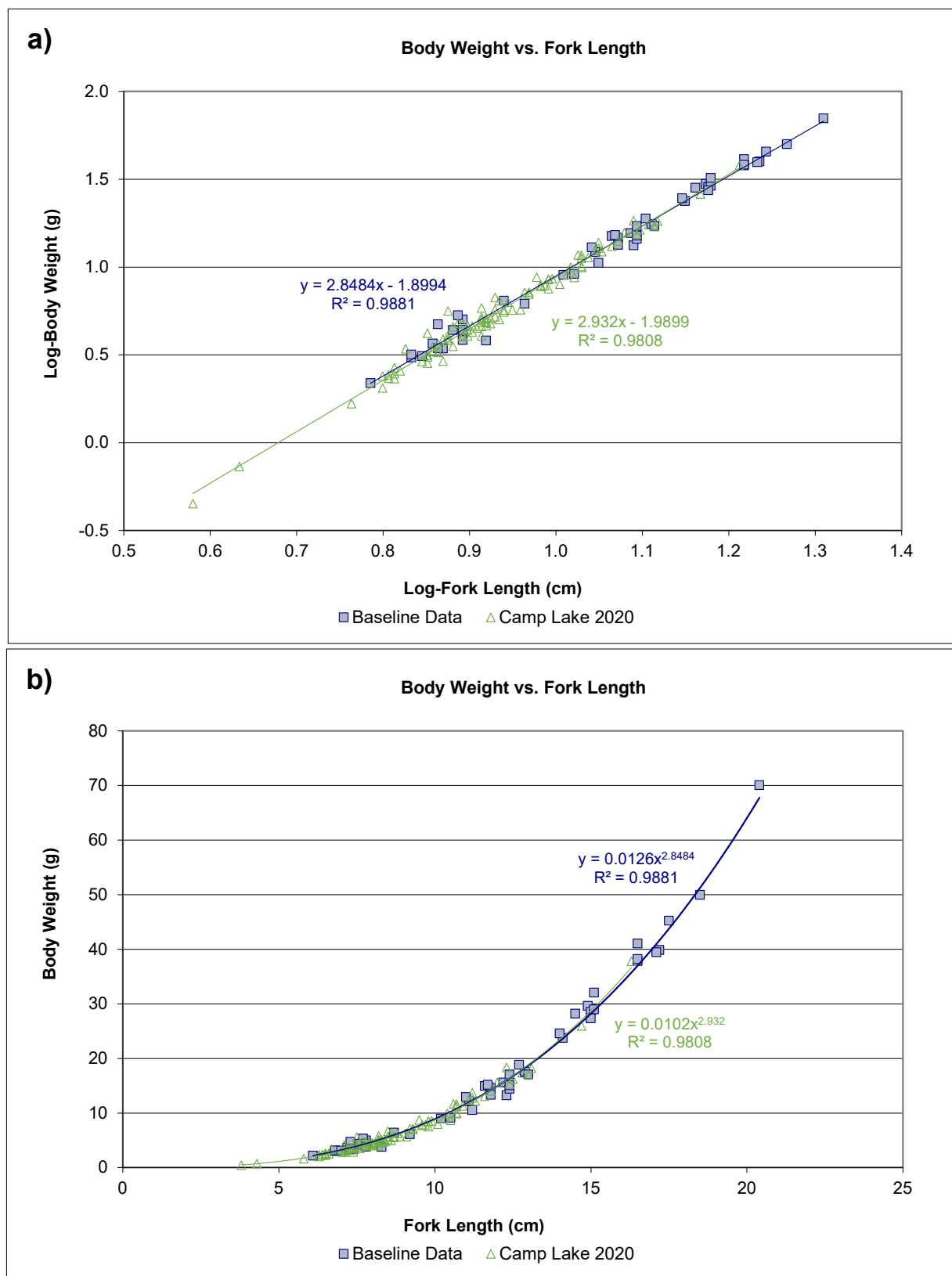


**Figure G.3: Comparison of Condition (Weight-at-fork length Relationship) for Arctic Charr Collected in Fall (August-September) at Camp Lake Nearshore Areas in 2019 and during the Mine Baseline Period (2013) using Log-transformed (a) and Untransformed (b) Data**

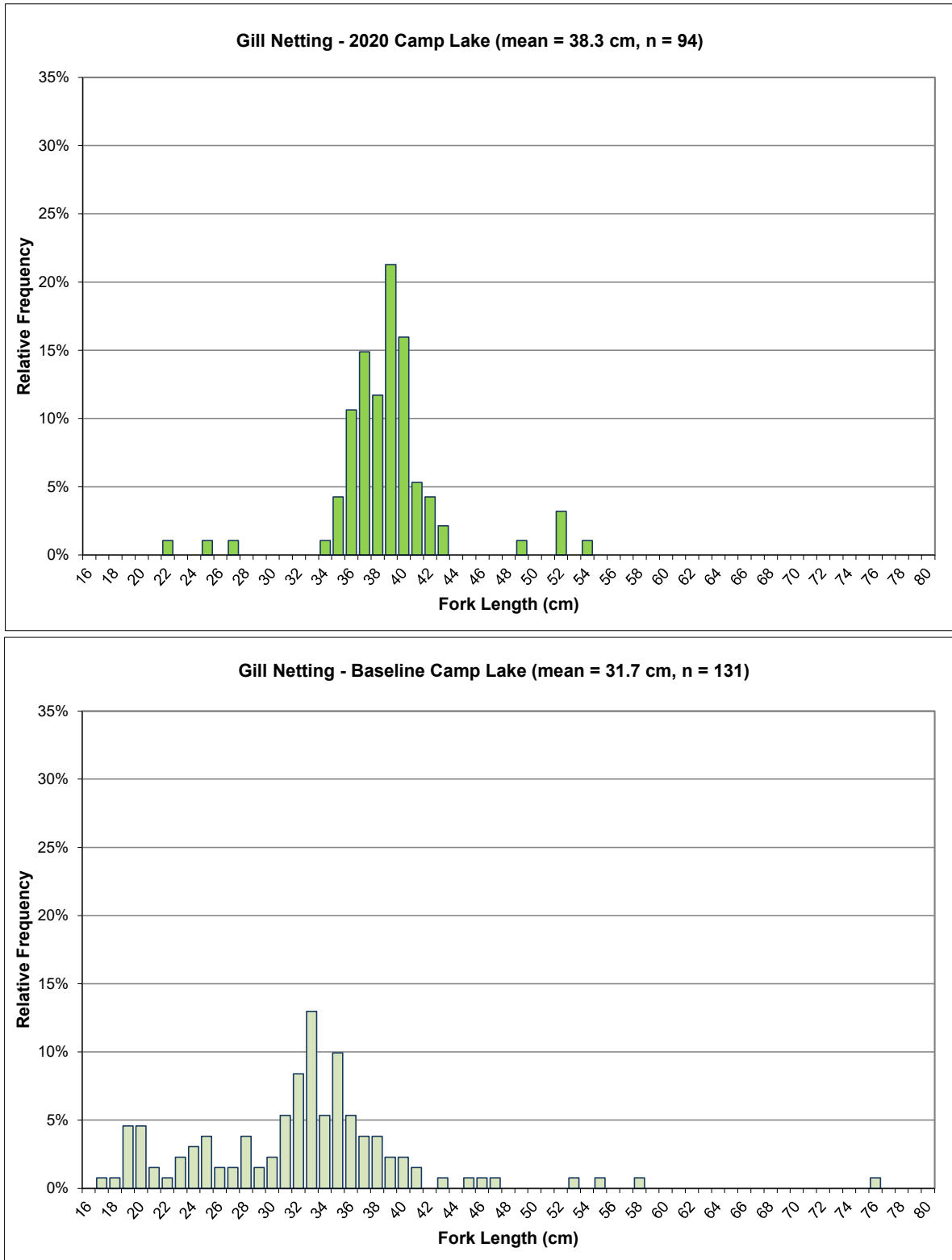


**Figure G.4: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Camp Lake (JLO) in 2020 and Baseline Studies Conducted in Fall, Mary River Project CREMP**

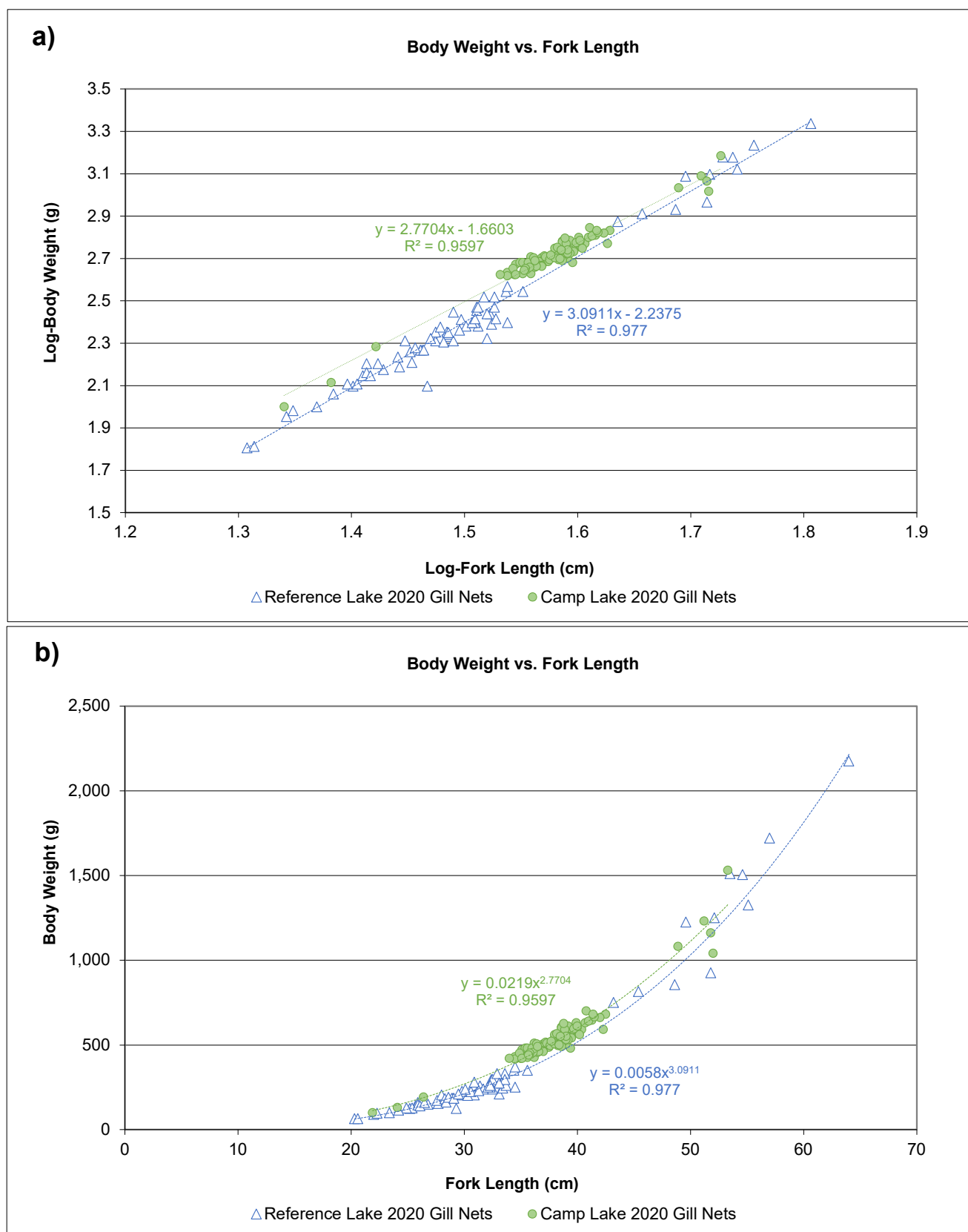


**Figure G.5: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at Littoral/Profundal Areas of Camp Lake and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

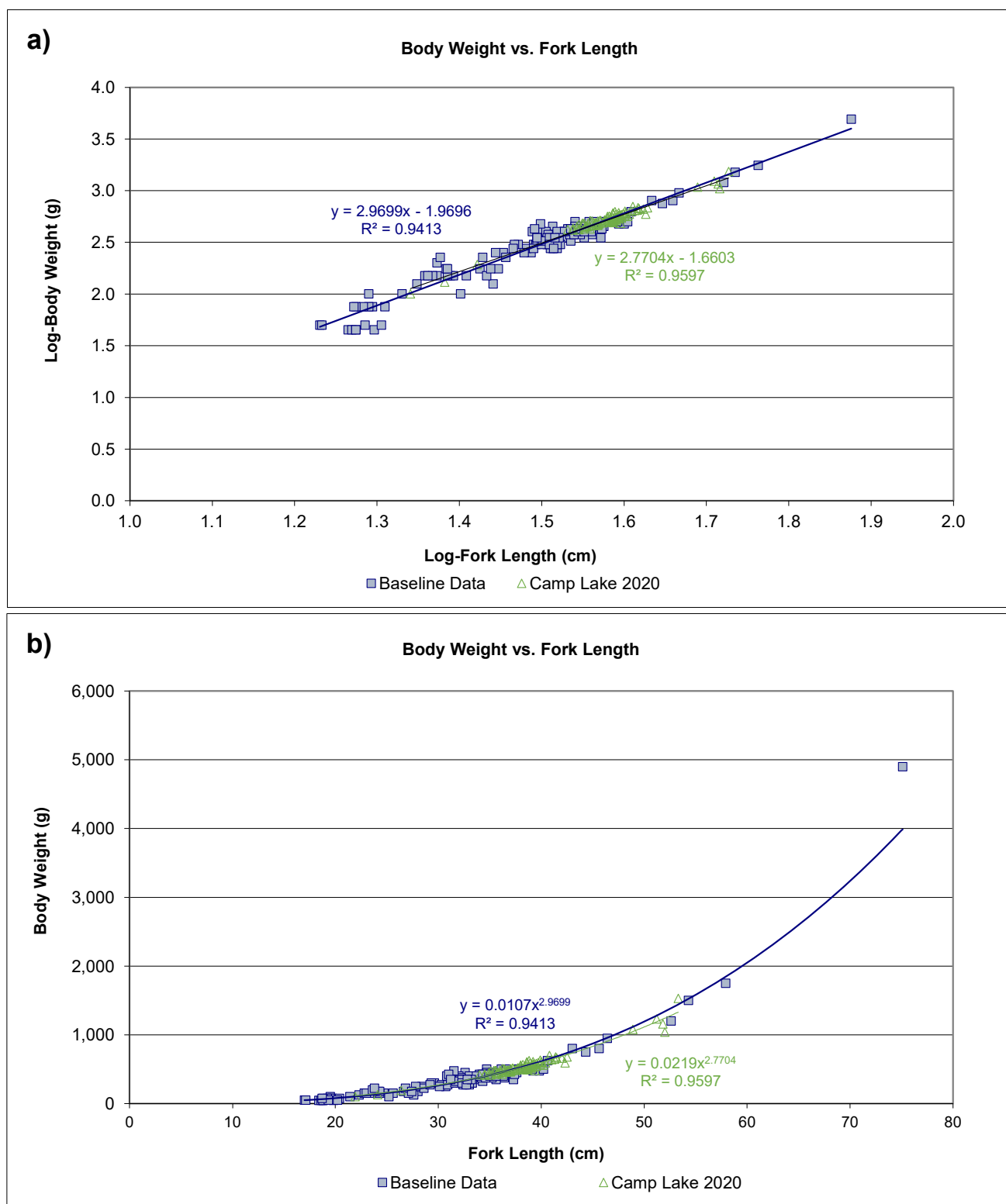


**Figure G.6: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Camp Lake Littoral/Profundal Areas in 2020 and during the Mine Baseline Period (2006, 2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data**

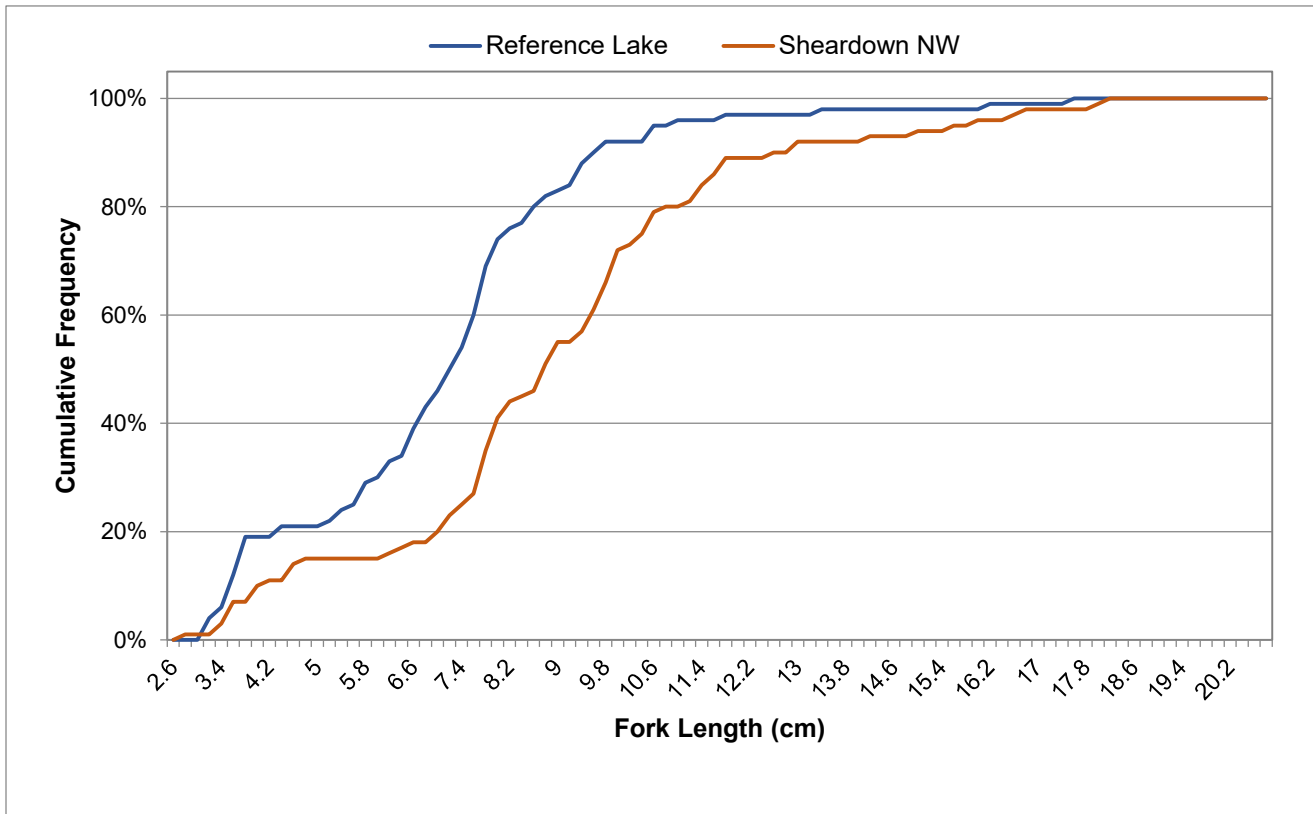


**Figure G.7:** Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Sheardown Lake NW and Reference Lake 3, Mary River Project CREMP, August 2020

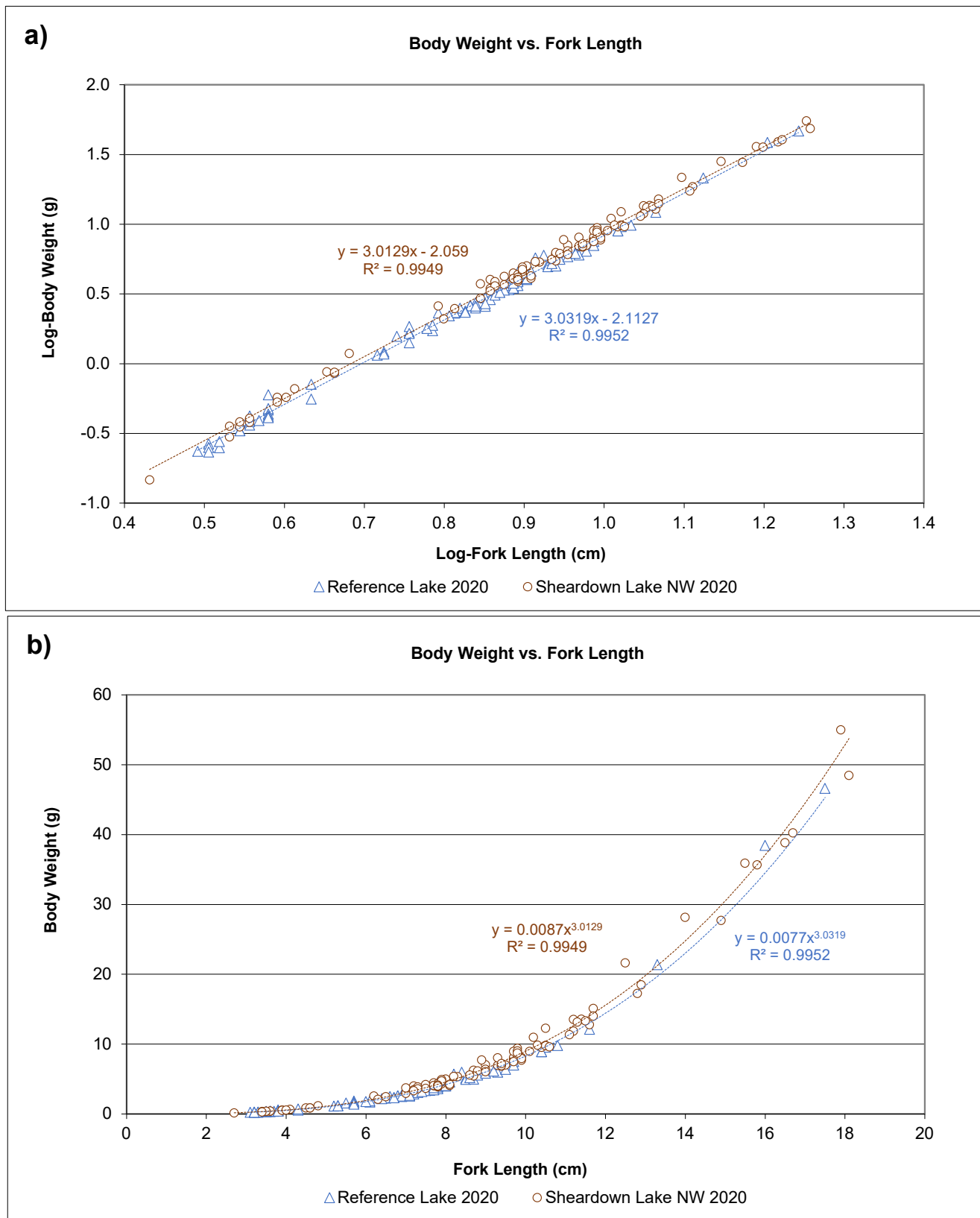


**Figure G.8: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at the Nearshore Area of Sheardown Lake NW and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

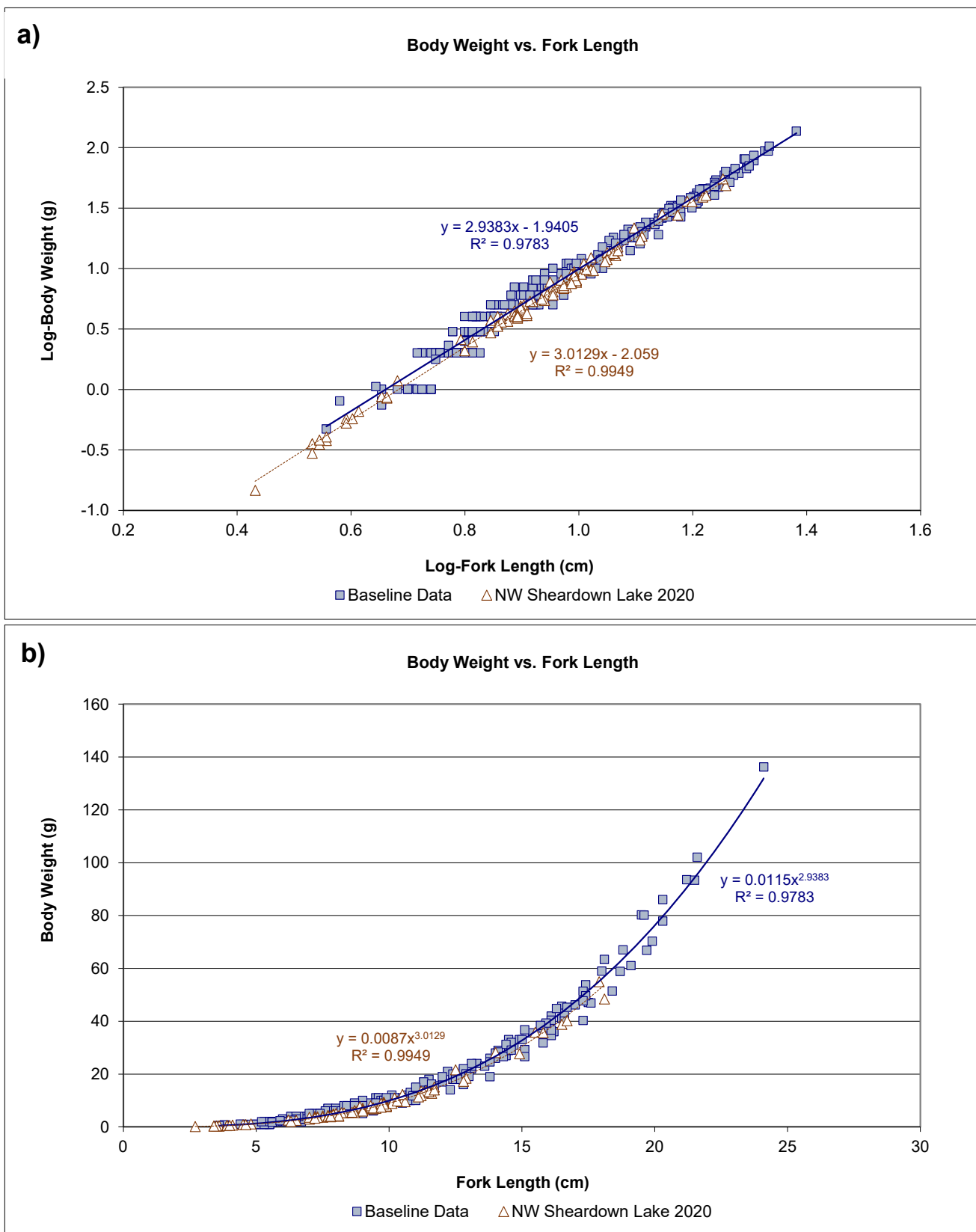


**Figure G.9: Comparison of Condition (Weight-at-fork length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake NW Nearshore Areas in 2020 and During the Mine Baseline Period (2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP**

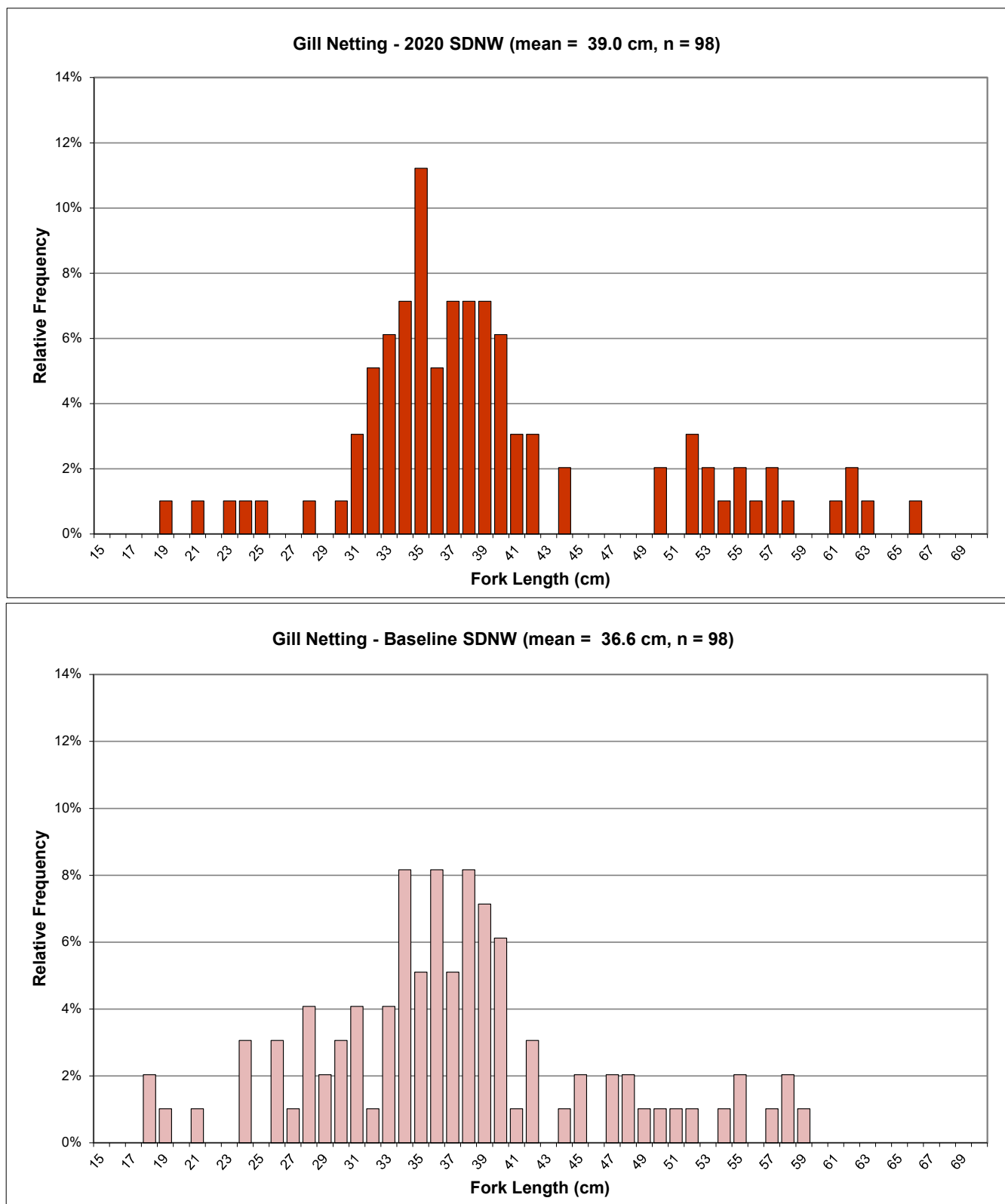


**Figure G.10: Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Sheardown Lake NW (DLO-01) in 2019 and Baseline Studies Conducted in Fall, Mary River Project CREMP**



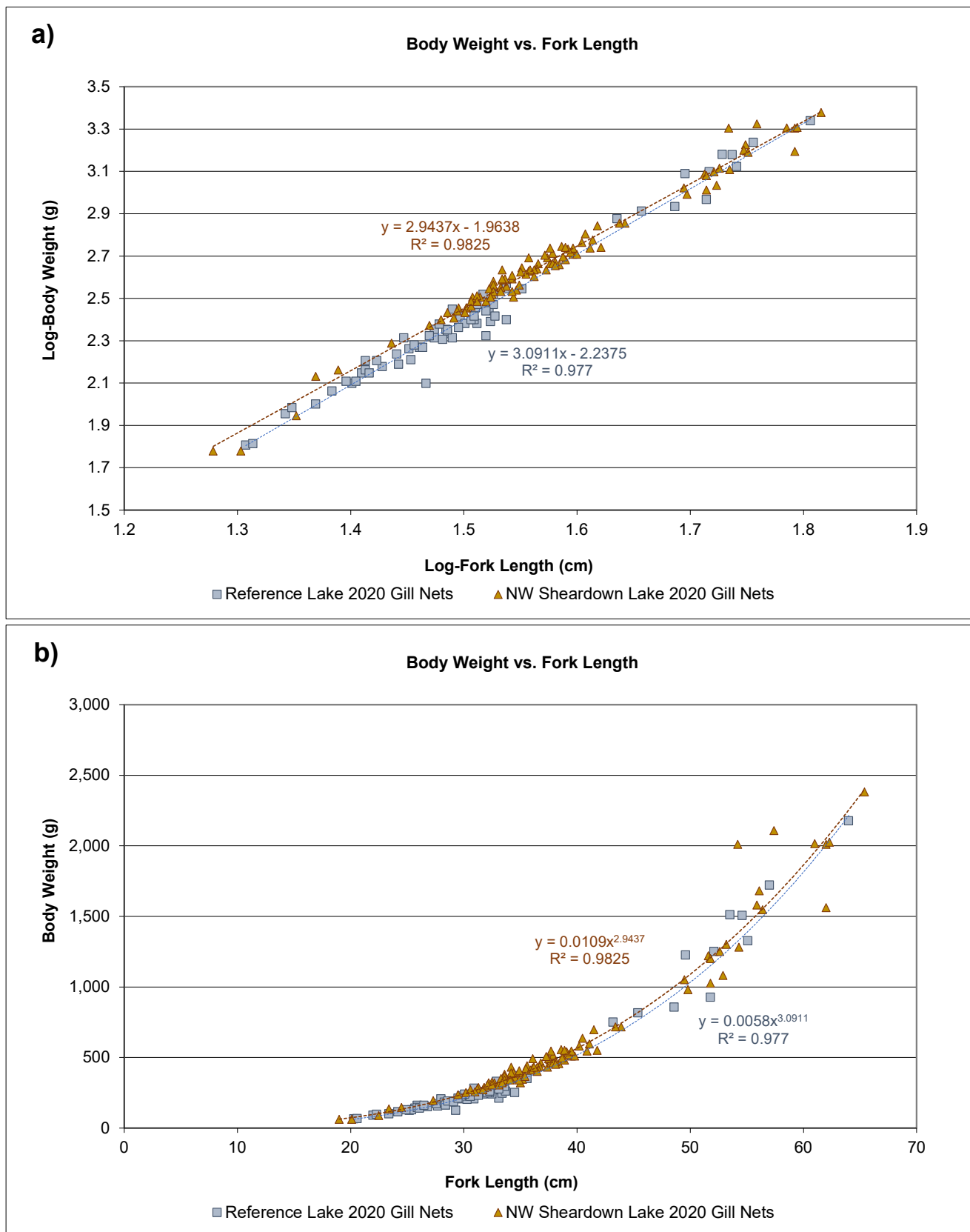


**Figure G.11: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at Littoral/Profundal Areas of Sheardown Lake NW and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

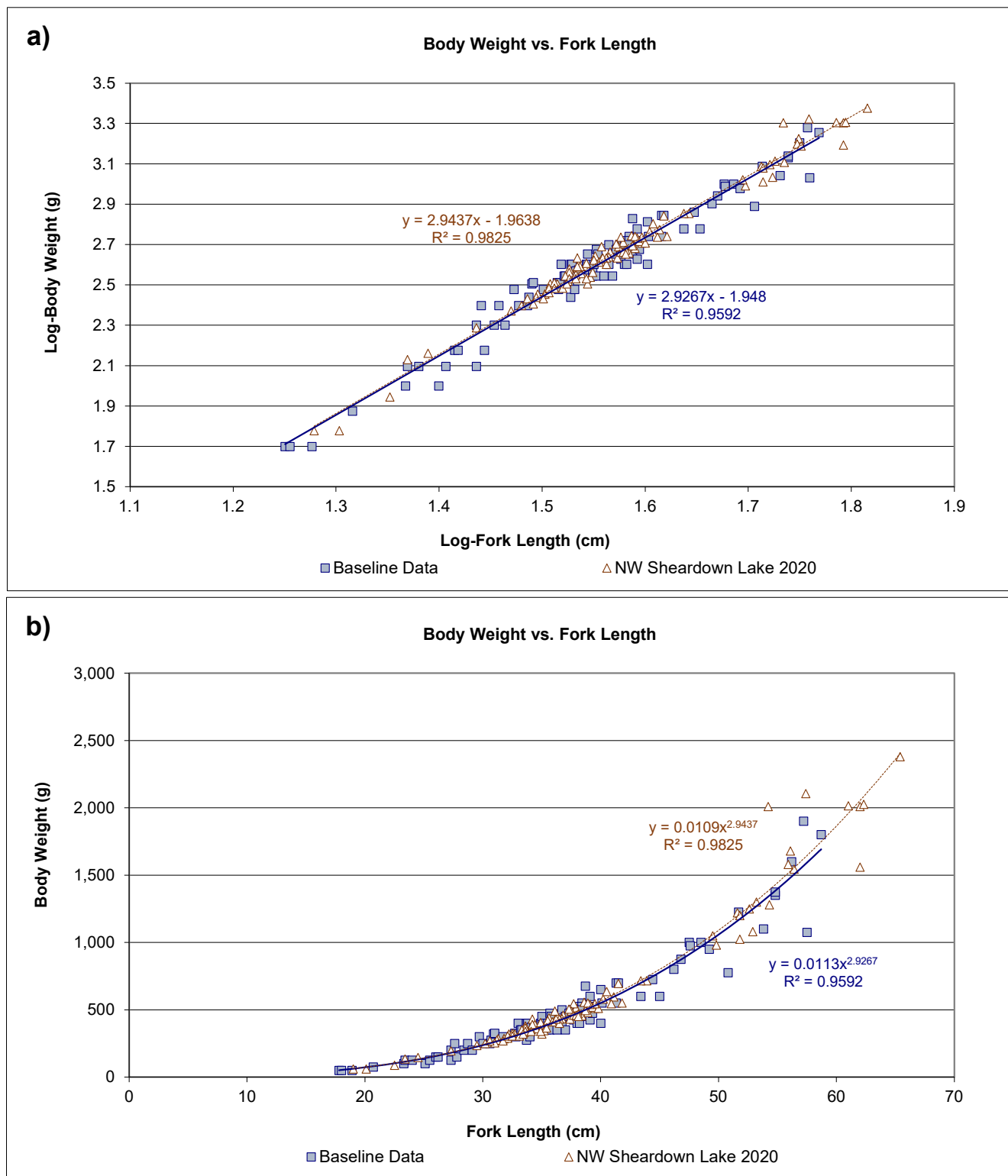


**Figure G.12: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake NW Nearshore Areas in 2020 and during the Mine Baseline Period (2006, 2007, 2008, 2013) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP**

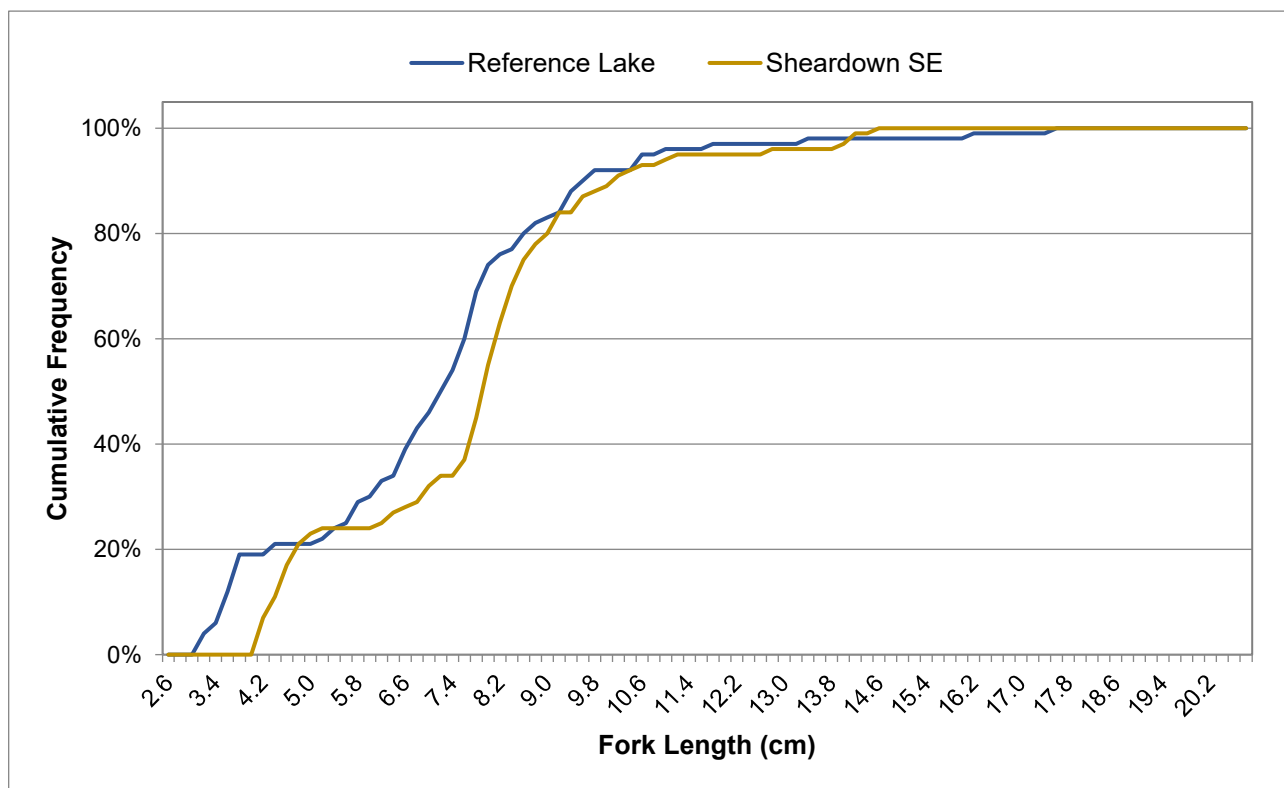


**Figure G.13: Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Sheardown Lake SE and Reference Lake 3, Mary River Project CREMP, August 2020**

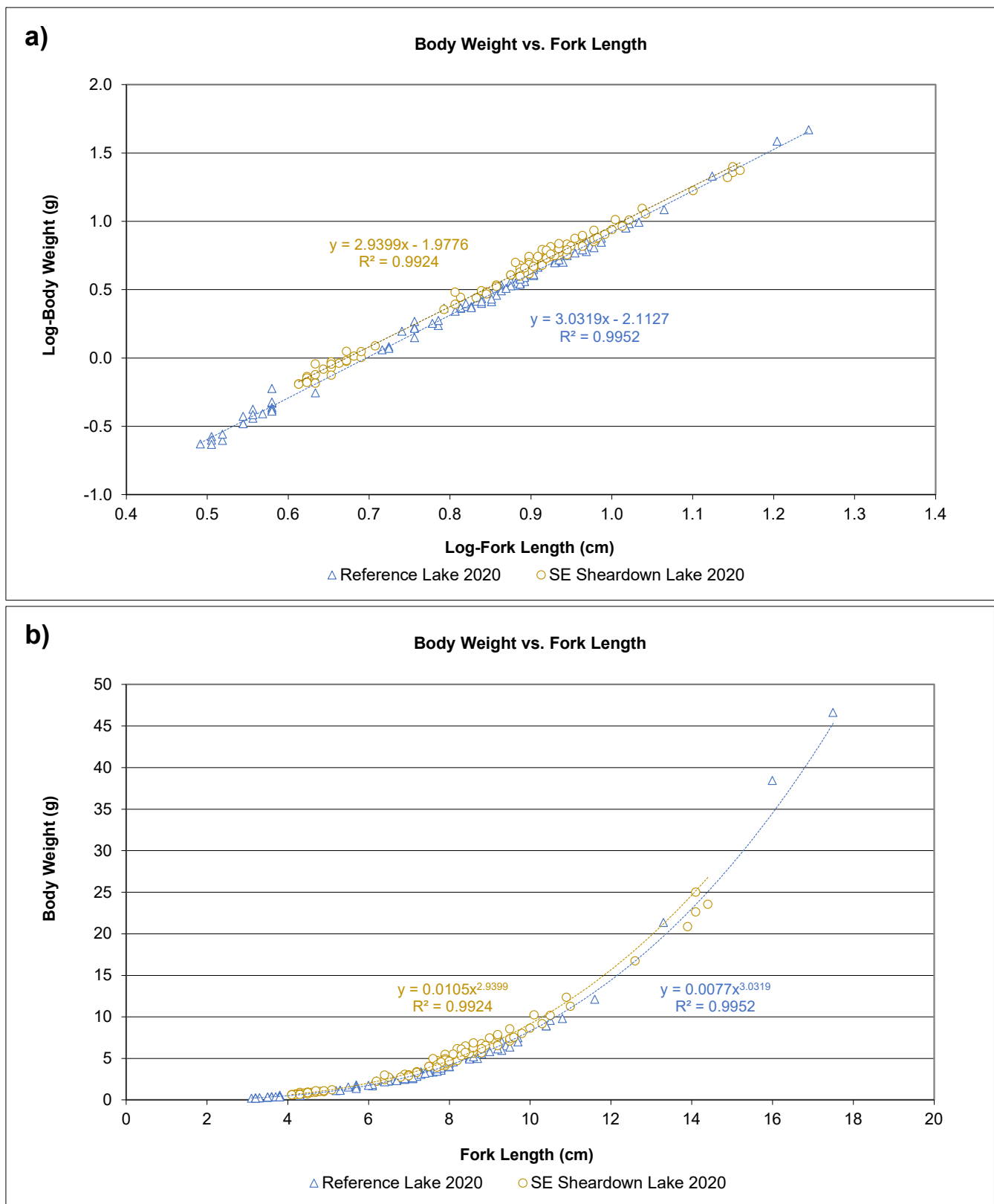


**Figure G.14: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected at the Nearshore Area of Sheardown Lake SE and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

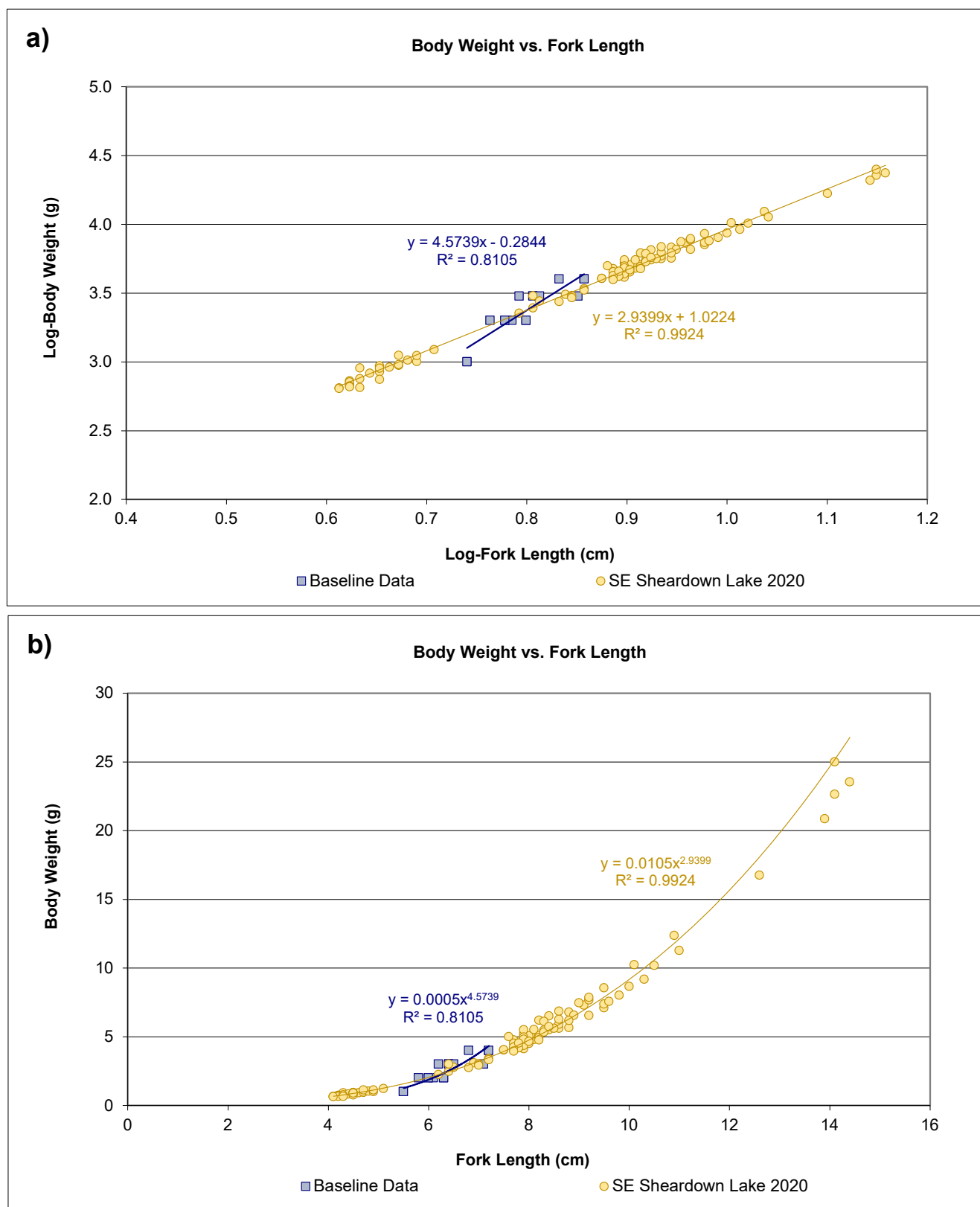


**Figure G.15: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Sheardown Lake SE Nearshore Areas in 2020 and During the Mine Baseline Period (2007) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP**

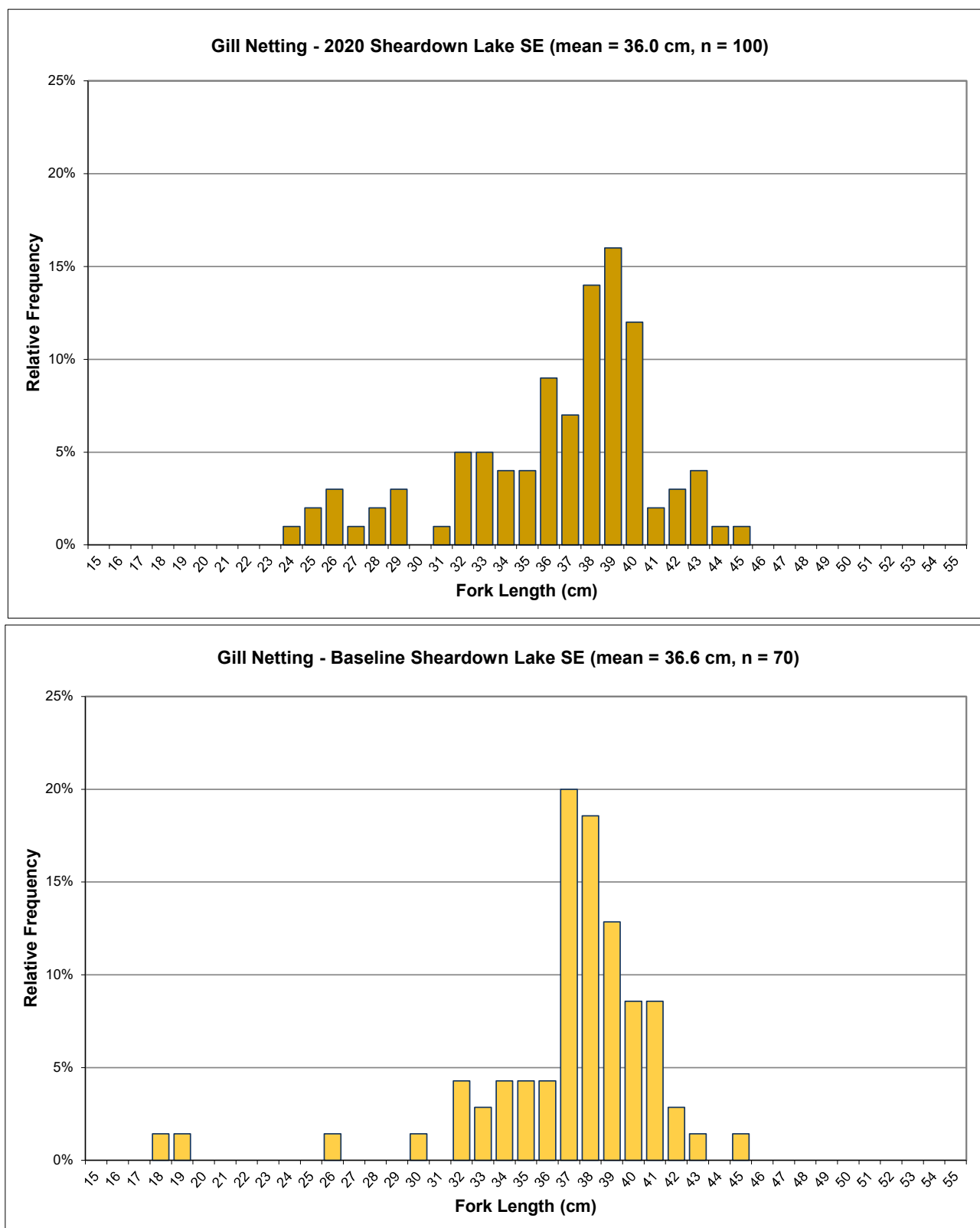


**Figure G.16:** Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Sheardown Lake SE (DLO-02) in 2020 and Baseline Studies Conducted in Fall, Mary River Project CREMP

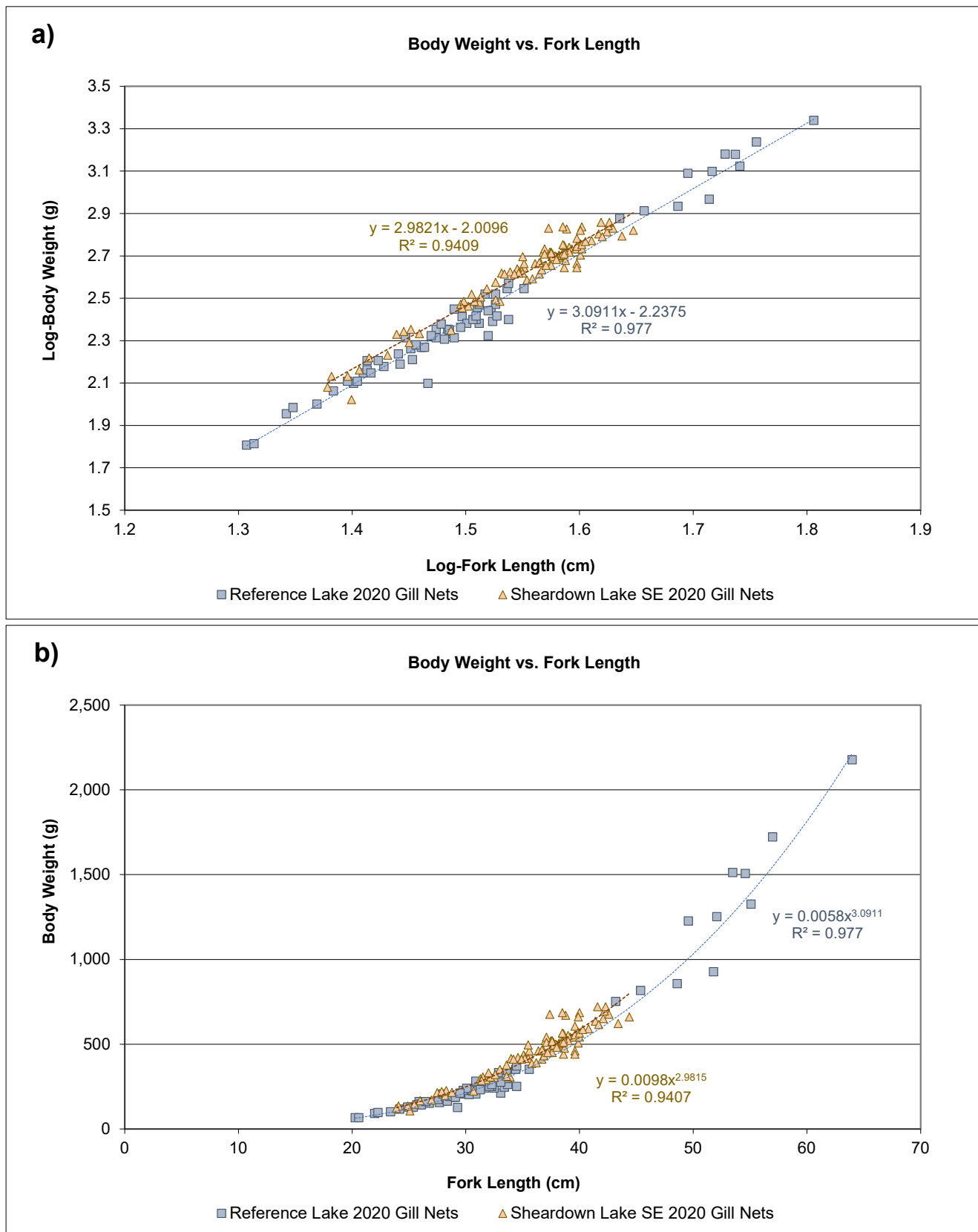


**Figure G.17: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at Littoral/Profundal Areas of Sheardown Lake SE and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

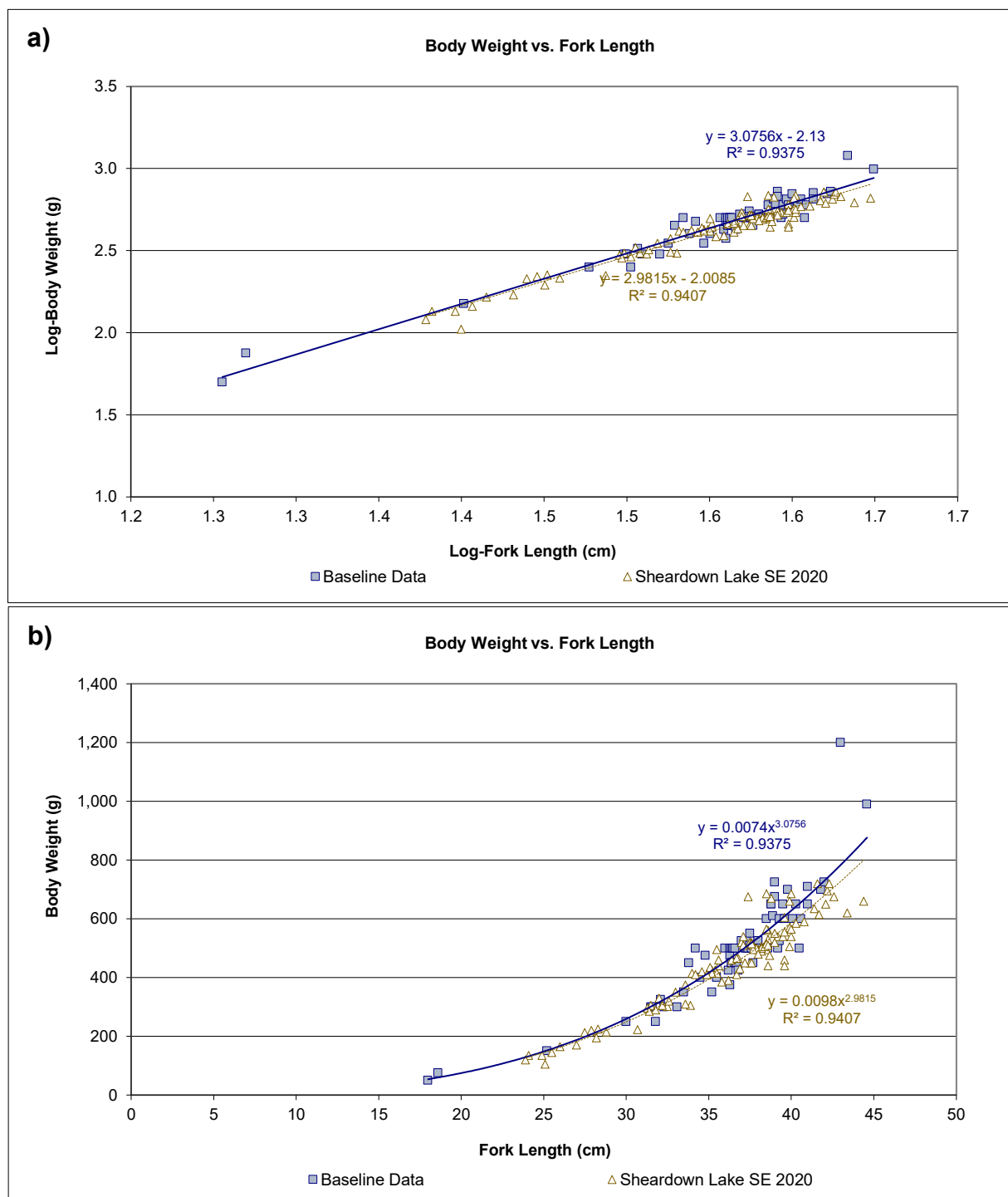


**Figure G.18: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr collected in Fall (August-September) at Sheardown Lake SE Nearshore Areas in 2020 and During the Mine Baseline Period (2007, 2008) using Log-transformed (a) and Untransformed (b) Data, Mary River Project CREMP**



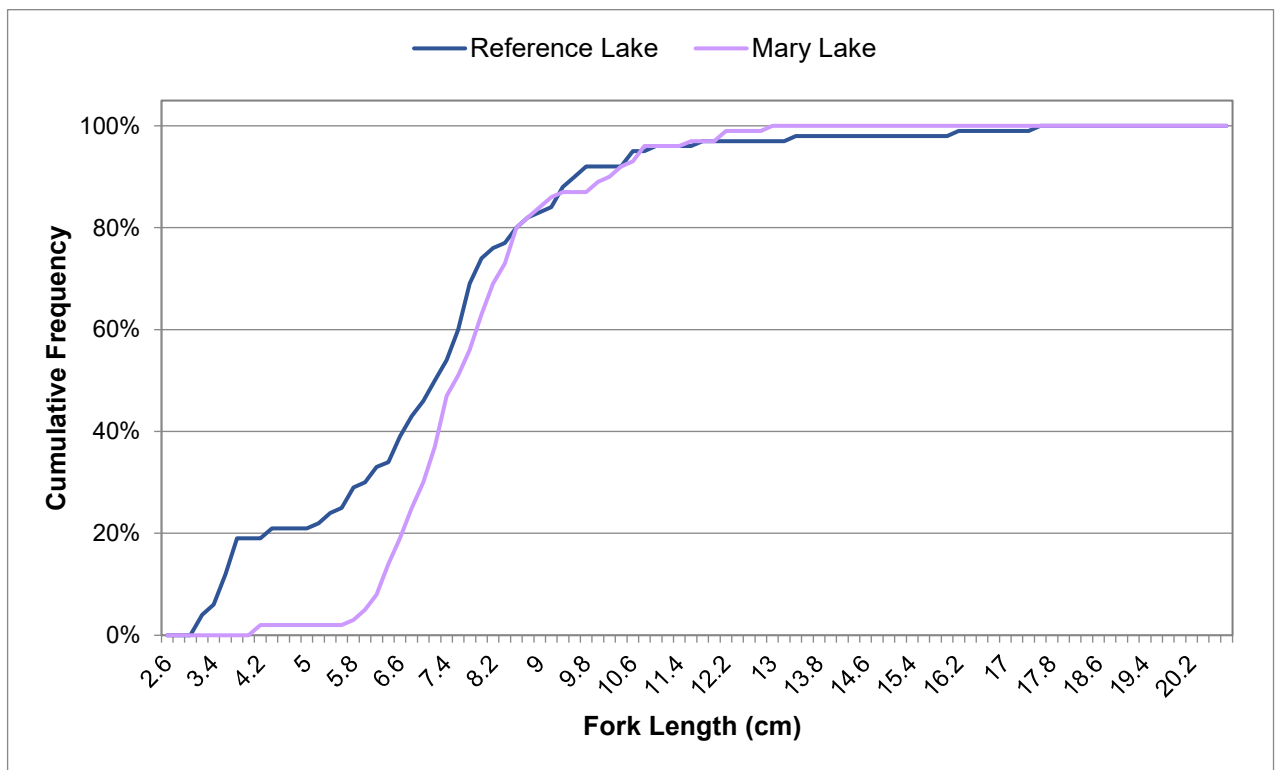


**Figure G.19:** Cumulative Length-frequency Distributions for Juvenile Arctic Charr Captured by Electrofishing at Nearshore Areas of Mary Lake and Reference Lake 3, Mary River Project CREMP, August 2020

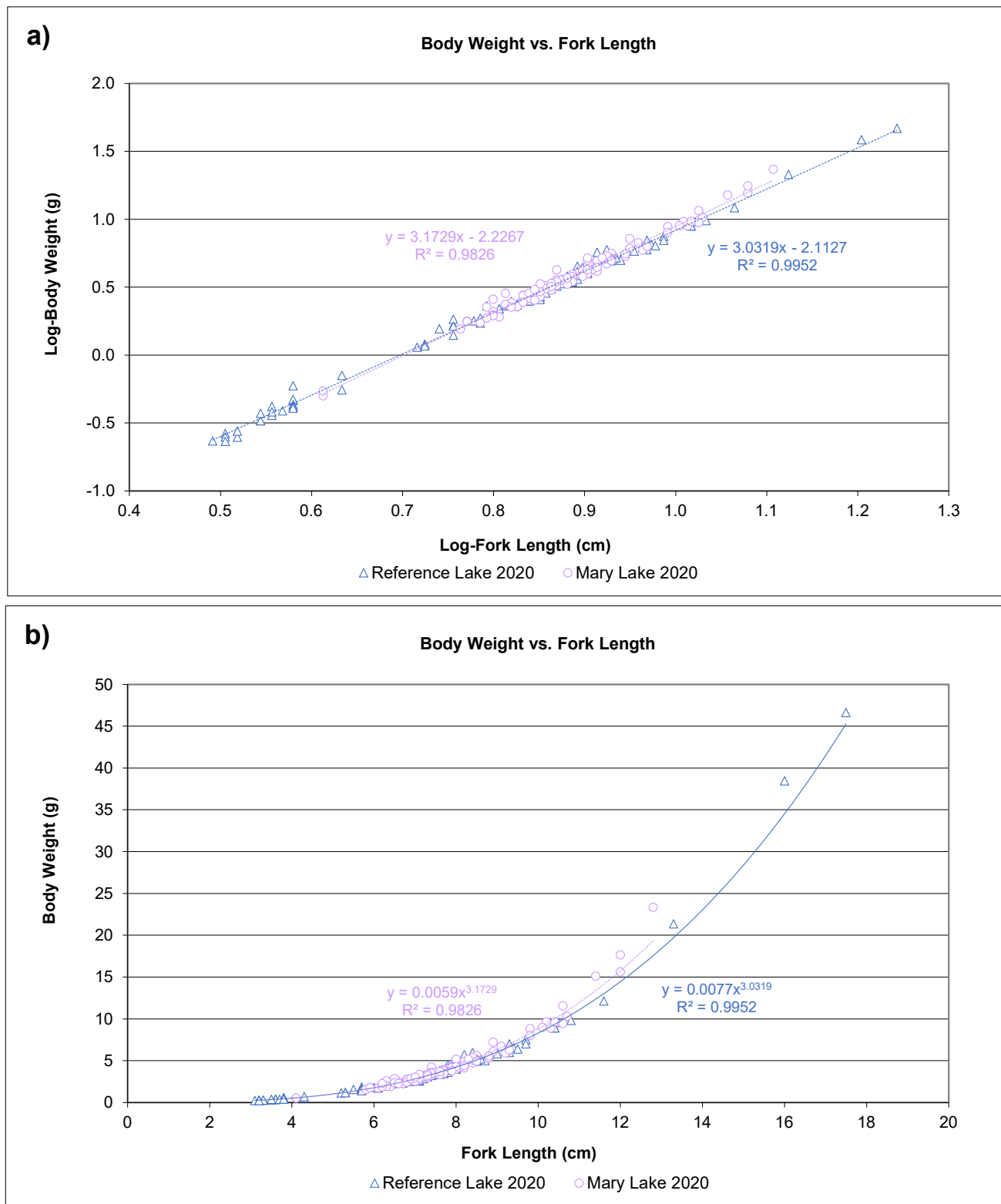


**Figure G.20: Comparison of Condition (Weight-at-fork-Length Relationship) for Arctic Charr Collected at the Nearshore Area of Mary Lake and Reference Lake 3 in August 2019 using Log-Transformed (a) and Untransformed (b) Data, Mary River Project 2020 CREMP**

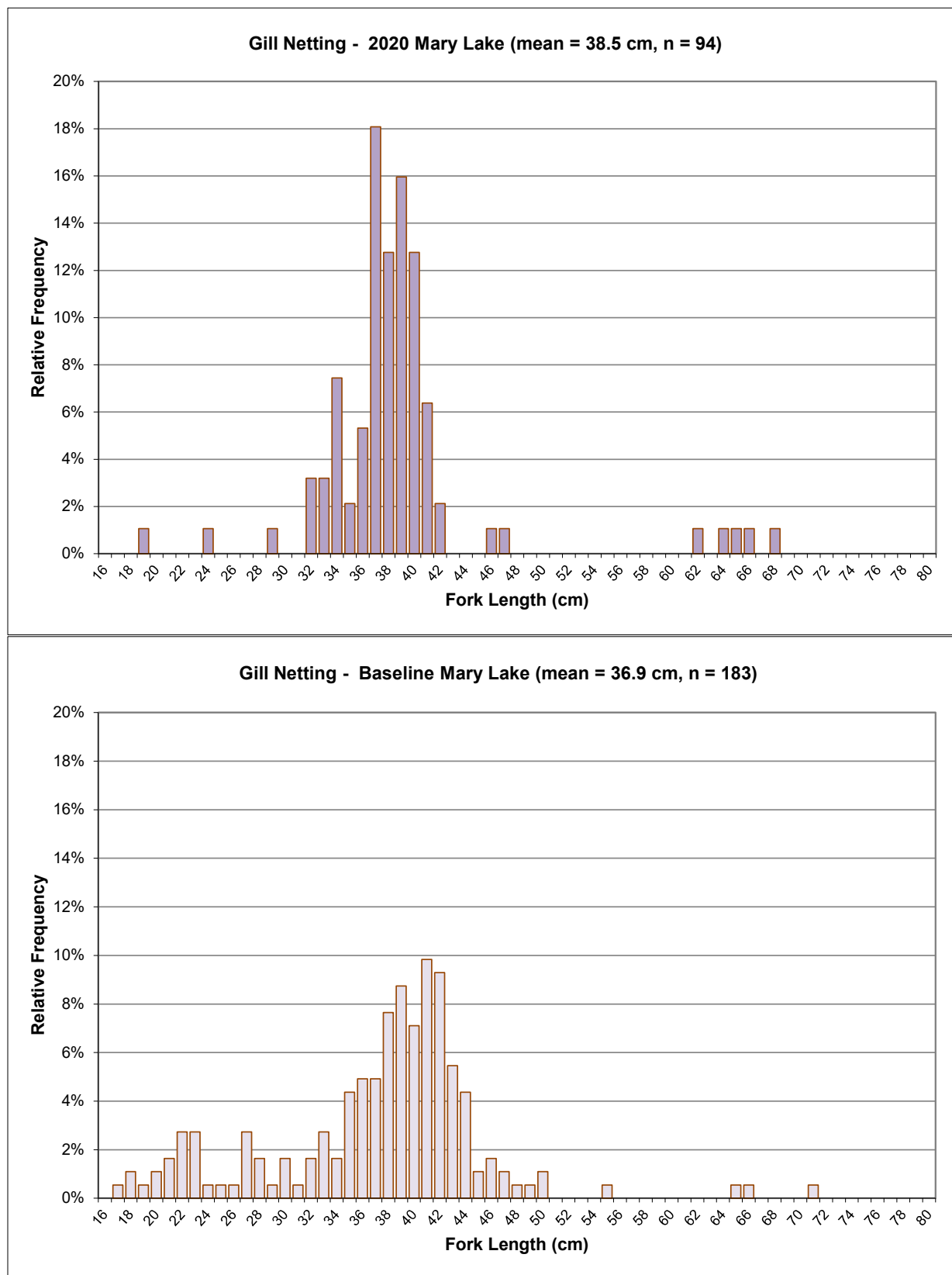


**Figure G.21:** Length-Frequency Distributions for Arctic Charr Captured by Gill Netting at Mary Lake (BLO) in 2020 and Baseline Studies Conducted in Fall

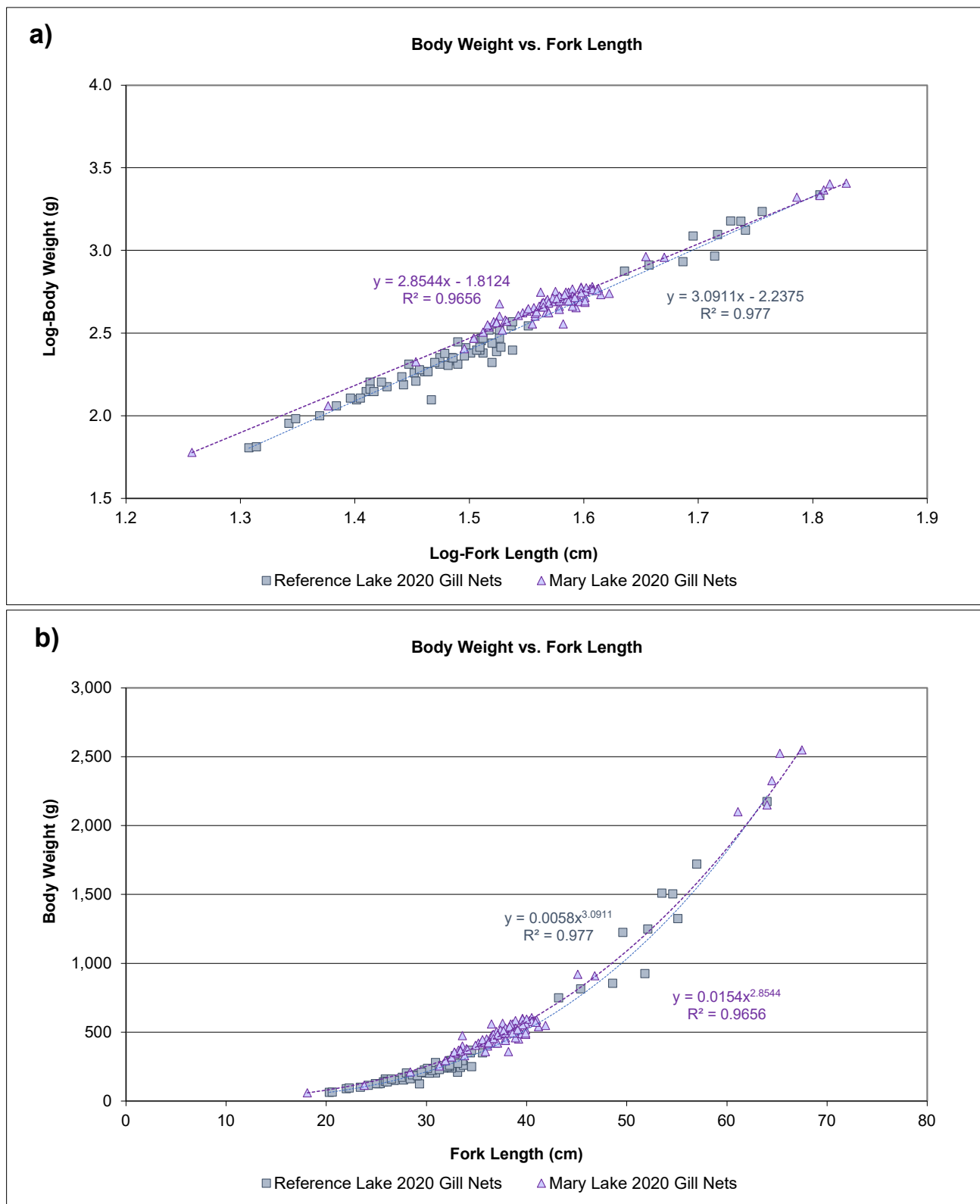


**Figure G.22: Comparison of Condition (Weight-at-fork-length Relationship) for Arctic Charr Collected at Littoral/Profundal Areas of Mary Lake and Reference Lake 3 in August 2020 using Log-transformed (a) and Untransformed (b) Data**

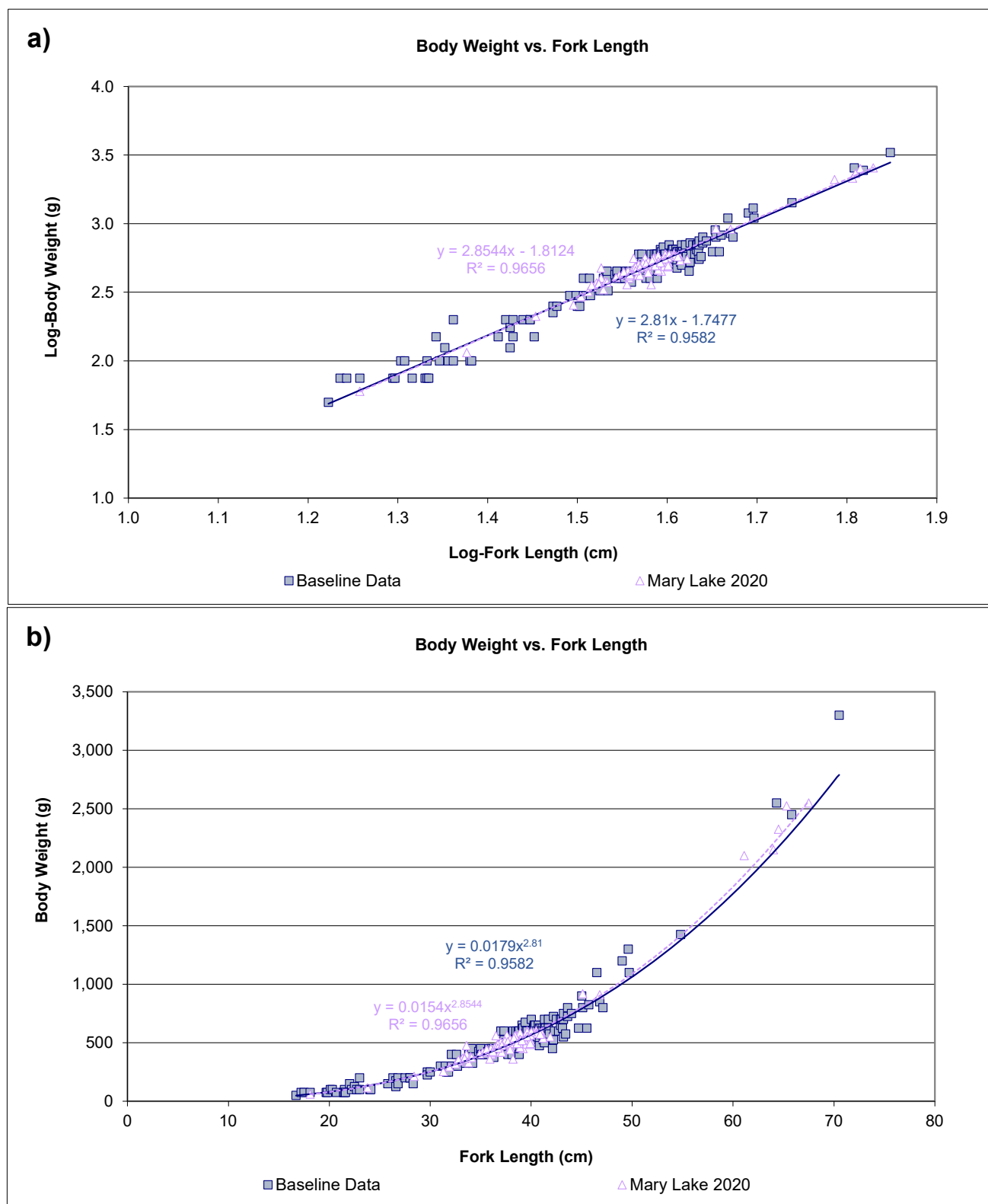


**Figure G.23: Comparison of Condition (Weight-at-fork Length Relationship) for Arctic Charr Collected in Fall (August-September) at Mary Lake Nearshore Areas in 2020 and During the Mine Baseline Period (2006, 2007) using Log-transformed (a) and Untransformed (b) Data**

Table G.1: Electrofishing Catch Records, Mary River Project CREMP, August 2020

| Waterbody         | Sample Station Identifier | Location<br>(NAD83, UTM Zone 17W) |          |         |          | Fishing Date | Electrofisher Settings |                  |                | No. of Passes | Effort (seconds) | Fish Species |                            |      |                        |                            |      | Total (all species) |      |
|-------------------|---------------------------|-----------------------------------|----------|---------|----------|--------------|------------------------|------------------|----------------|---------------|------------------|--------------|----------------------------|------|------------------------|----------------------------|------|---------------------|------|
|                   |                           |                                   |          |         |          |              |                        |                  |                |               |                  | Arctic Charr |                            |      | Nine-spine Stickleback |                            |      |                     |      |
|                   |                           | Start                             |          | Finish  |          |              | Output Voltage (volts) | Cycle Freq. (Hz) | Duty Cycle (%) |               |                  | No. Captured | No. Mortalities / Retained | CPUE | No. Captured           | No. Mortalities / Retained | CPUE | Total Catch         | CPUE |
|                   |                           | Easting                           | Northing | Easting | Northing |              |                        |                  |                |               |                  |              |                            |      |                        |                            |      |                     |      |
| Reference Lake 3  | REF3-20-EF-1              | 574891                            | 7853038  | 575033  | 7853053  | 14-Aug-20    | 500                    | 30               | 12             | 1             | 3,845            | 134          | 11                         | 2.09 | 1                      | 0                          | 0.02 | 135                 | 2.11 |
| Camp Lake         | JLO-20-EF-1               | 557802                            | 7914653  | 557805  | 7914617  | 10-Aug-20    | 500                    | 30               | 12             | 2             | 1,326            | 109          | 10                         | 4.93 | 18                     | 0                          | 0.81 | 127                 | 5.75 |
| Sheardown Lake NW | DL01-20-EF-1              | 560206                            | 7913484  | 560309  | 7913475  | 10-Aug-20    | 500                    | 30               | 12             | 1             | 1,588            | 118          | 10                         | 4.46 | 6                      | 0                          | 0.23 | 124                 | 4.69 |
| Sheardown Lake SE | DL02-20-EF-1              | 560709                            | 7912330  | 560725  | 7912310  | 11-Aug-20    | 500                    | 30               | 12             | 1             | 1,611            | 115          | 10                         | 4.28 | 63                     | 0                          | 2.35 | 178                 | 6.63 |
| Mary Lake         | BLO-20-EF-1               | 555410                            | 7905139  | 555481  | 7905040  | 11-Aug-20    | 500                    | 30               | 12             | 1             | 2,091            | 105          | 10                         | 3.01 | 26                     | 0                          | 0.75 | 131                 | 3.76 |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per electrofishing minute.

**Table G.2: Gill Netting Catch Records for Reference Lake 3, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location<br>(NAD83, UTM Zone 17W) |          | Length<br>(m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort<br>(m*hrs/100 m) | Arctic Charr Catch<br>Per Mesh Size |    |    | Total Catch | CPUE  |
|-----------------|-----------------------------------|----------|---------------|-----------|-----------|----------|-----------|---------------|-------------------------|-------------------------------------|----|----|-------------|-------|
|                 | Easting                           | Northing |               |           |           |          |           |               |                         | 1½"                                 | 2" | 3" |             |       |
| REF3-20-GN-1A   | 574556                            | 7853020  | 91.4          | 12-Aug-20 | 12-Aug-20 | 10:30    | 12:21     | 1.85          | 1.69                    | 0                                   | 4  | 0  | 4           | 2.36  |
| REF3-20-GN-1B   | 574556                            | 7853020  | 91.4          | 12-Aug-20 | 12-Aug-20 | 12:37    | 14:16     | 1.65          | 1.51                    | 0                                   | 2  | 0  | 2           | 1.33  |
| REF3-20-GN-1C   | 574556                            | 7853020  | 91.4          | 12-Aug-20 | 12-Aug-20 | 14:27    | 15:41     | 1.23          | 1.13                    | 0                                   | 2  | 1  | 3           | 2.66  |
| REF3-20-GN-1D   | 574556                            | 7853020  | 91.4          | 12-Aug-20 | 12-Aug-20 | 15:57    | 17:46     | 1.82          | 1.66                    | 1                                   | 3  | 1  | 5           | 3.01  |
| REF3-20-GN-2A   | 574524                            | 7853031  | 91.4          | 12-Aug-20 | 12-Aug-20 | 10:36    | 12:39     | 2.05          | 1.87                    | 0                                   | 3  | 0  | 3           | 1.60  |
| REF3-20-GN-2B   | 574524                            | 7853031  | 91.4          | 12-Aug-20 | 12-Aug-20 | 12:51    | 14:07     | 1.27          | 1.16                    | 1                                   | 0  | 0  | 1           | 0.863 |
| REF3-20-GN-2C   | 574524                            | 7853031  | 91.4          | 12-Aug-20 | 12-Aug-20 | 14:31    | 15:59     | 1.47          | 1.34                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-2D   | 574524                            | 7853031  | 91.4          | 12-Aug-20 | 12-Aug-20 | 16:07    | 18:01     | 1.90          | 1.74                    | 0                                   | 2  | 1  | 3           | 1.73  |
| REF3-20-GN-3A   | 573853                            | 7852739  | 91.4          | 12-Aug-20 | 12-Aug-20 | 10:42    | 12:56     | 2.23          | 2.04                    | 0                                   | 5  | 0  | 5           | 2.45  |
| REF3-20-GN-3B   | 573853                            | 7852739  | 91.4          | 12-Aug-20 | 12-Aug-20 | 13:12    | 14:37     | 1.42          | 1.30                    | 1                                   | 0  | 0  | 1           | 0.772 |
| REF3-20-GN-3C   | 573853                            | 7852739  | 91.4          | 12-Aug-20 | 12-Aug-20 | 14:47    | 16:12     | 1.42          | 1.30                    | 1                                   | 0  | 0  | 1           | 0.772 |
| REF3-20-GN-3D   | 573853                            | 7852739  | 91.4          | 12-Aug-20 | 12-Aug-20 | 16:23    | 17:32     | 1.15          | 1.05                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-4A   | 574320                            | 7853695  | 61.0          | 12-Aug-20 | 12-Aug-20 | 10:51    | 13:20     | 2.48          | 1.51                    | 1                                   | -  | 0  | 1           | 0.661 |
| REF3-20-GN-4B   | 574320                            | 7853695  | 61.0          | 12-Aug-20 | 12-Aug-20 | 13:25    | 15:00     | 1.58          | 0.965                   | 0                                   | -  | 0  | 0           | 0     |
| REF3-20-GN-4C   | 574320                            | 7853695  | 61.0          | 12-Aug-20 | 12-Aug-20 | 15:07    | 16:28     | 1.35          | 0.823                   | 0                                   | -  | 0  | 0           | 0     |
| REF3-20-GN-4D   | 574320                            | 7853695  | 61.0          | 12-Aug-20 | 12-Aug-20 | 16:33    | 17:05     | 0.53          | 0.325                   | 0                                   | -  | 0  | 0           | 0     |
| REF3-20-GN-5A   | 574259                            | 7853606  | 91.4          | 12-Aug-20 | 12-Aug-20 | 10:56    | 13:28     | 2.53          | 2.32                    | 3                                   | 4  | 0  | 7           | 3.02  |
| REF3-20-GN-5B   | 574259                            | 7853606  | 91.4          | 12-Aug-20 | 12-Aug-20 | 13:47    | 15:08     | 1.35          | 1.23                    | 0                                   | 0  | 0  | 0           | 0     |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

**Table G.2: Gill Netting Catch Records for Reference Lake 3, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location<br>(NAD83, UTM Zone 17W) |          | Length<br>(m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort<br>(m*hrs/100 m) | Arctic Charr Catch<br>Per Mesh Size |    |    | Total Catch | CPUE  |
|-----------------|-----------------------------------|----------|---------------|-----------|-----------|----------|-----------|---------------|-------------------------|-------------------------------------|----|----|-------------|-------|
|                 | Easting                           | Northing |               |           |           |          |           |               |                         | 1½"                                 | 2" | 3" |             |       |
| REF3-20-GN-5C   | 574259                            | 7853606  | 91.4          | 12-Aug-20 | 12-Aug-20 | 15:21    | 16:52     | 1.52          | 1.39                    | 1                                   | 1  | 0  | 2           | 1.44  |
| REF3-20-GN-6A   | 573984                            | 7853562  | 91.4          | 12-Aug-20 | 12-Aug-20 | 11:05    | 13:57     | 2.87          | 2.62                    | 0                                   | 0  | 1  | 1           | 0.381 |
| REF3-20-GN-6B   | 573984                            | 7853562  | 91.4          | 12-Aug-20 | 12-Aug-20 | 13:59    | 15:25     | 1.43          | 1.31                    | 0                                   | 1  | 0  | 1           | 0.763 |
| REF3-20-GN-6C   | 573984                            | 7853562  | 91.4          | 12-Aug-20 | 12-Aug-20 | 15:35    | 17:05     | 1.50          | 1.37                    | 1                                   | 2  | 0  | 3           | 2.19  |
| REF3-20-GN-7A   | 574568                            | 7853018  | 91.4          | 14-Aug-20 | 14-Aug-20 | 10:31    | 11:41     | 1.17          | 1.07                    | 1                                   | 1  | 0  | 2           | 1.87  |
| REF3-20-GN-7B   | 574568                            | 7853018  | 91.4          | 14-Aug-20 | 14-Aug-20 | 11:51    | 13:09     | 1.30          | 1.19                    | 0                                   | 0  | 1  | 1           | 0.841 |
| REF3-20-GN-7C   | 574568                            | 7853018  | 91.4          | 14-Aug-20 | 14-Aug-20 | 13:20    | 15:00     | 1.67          | 1.52                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-7D   | 574568                            | 7853018  | 91.4          | 14-Aug-20 | 14-Aug-20 | 15:09    | 16:43     | 1.57          | 1.43                    | 0                                   | 2  | 0  | 2           | 1.40  |
| REF3-20-GN-7E   | 574568                            | 7853018  | 91.4          | 14-Aug-20 | 14-Aug-20 | 16:55    | 17:55     | 1.00          | 0.914                   | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-8A   | 574532                            | 7853048  | 61.0          | 14-Aug-20 | 14-Aug-20 | 10:35    | 11:53     | 1.30          | 0.792                   | 0                                   | -  | 0  | 0           | 0     |
| REF3-20-GN-8B   | 574532                            | 7853048  | 61.0          | 14-Aug-20 | 14-Aug-20 | 12:01    | 13:24     | 1.38          | 0.843                   | 0                                   | -  | 0  | 0           | 0     |
| REF3-20-GN-8C   | 574532                            | 7853048  | 91.4          | 14-Aug-20 | 14-Aug-20 | 14:56    | 16:56     | 2.00          | 1.83                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-8D   | 574532                            | 7853048  | 91.4          | 14-Aug-20 | 14-Aug-20 | 17:08    | 18:02     | 0.90          | 0.823                   | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-9A   | 573788                            | 7852693  | 91.4          | 14-Aug-20 | 14-Aug-20 | 10:43    | 12:07     | 1.40          | 1.28                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-9B   | 573788                            | 7852693  | 91.4          | 14-Aug-20 | 14-Aug-20 | 12:15    | 13:40     | 1.42          | 1.30                    | 0                                   | 4  | 1  | 5           | 3.86  |
| REF3-20-GN-9C   | 573788                            | 7852693  | 91.4          | 14-Aug-20 | 14-Aug-20 | 13:57    | 15:25     | 1.47          | 1.34                    | 0                                   | 1  | 0  | 1           | 0.746 |
| REF3-20-GN-9D   | 573788                            | 7852693  | 91.4          | 14-Aug-20 | 14-Aug-20 | 15:33    | 17:14     | 1.68          | 1.54                    | 0                                   | 2  | 0  | 2           | 1.30  |
| REF3-20-GN-10A  | 574293                            | 7853675  | 91.4          | 14-Aug-20 | 14-Aug-20 | 10:52    | 12:19     | 1.45          | 1.33                    | 0                                   | 0  | 0  | 0           | 0     |
| REF3-20-GN-10B  | 574293                            | 7853675  | 91.4          | 14-Aug-20 | 14-Aug-20 | 12:28    | 14:04     | 1.60          | 1.46                    | 0                                   | 0  | 0  | 0           | 0     |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m-hours of net.



**Table G.2: Gill Netting Catch Records for Reference Lake 3, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location<br>(NAD83, UTM Zone 17W) |          | Length<br>(m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort<br>(m*hrs/100 m) | Arctic Charr Catch<br>Per Mesh Size |           |          | Total Catch | CPUE         |
|-----------------|-----------------------------------|----------|---------------|-----------|-----------|----------|-----------|---------------|-------------------------|-------------------------------------|-----------|----------|-------------|--------------|
|                 | Easting                           | Northing |               |           |           |          |           |               |                         | 1½"                                 | 2"        | 3"       |             |              |
| REF3-20-GN-10C  | 574293                            | 7853675  | 61.0          | 14-Aug-20 | 14-Aug-20 | 14:10    | 15:52     | 1.70          | 1.04                    | 0                                   | -         | 0        | 0           | 0            |
| REF3-20-GN-10D  | 574293                            | 7853675  | 61.0          | 14-Aug-20 | 14-Aug-20 | 16:03    | 17:27     | 1.40          | 0.853                   | 0                                   | -         | 0        | 0           | 0            |
| REF3-20-GN-11A  | 574205                            | 7853558  | 91.4          | 14-Aug-20 | 14-Aug-20 | 11:00    | 12:31     | 1.52          | 1.39                    | 0                                   | 0         | 0        | 0           | 0            |
| REF3-20-GN-11B  | 574205                            | 7853558  | 91.4          | 14-Aug-20 | 14-Aug-20 | 12:38    | 14:12     | 1.57          | 1.43                    | 0                                   | 3         | 1        | 4           | 2.79         |
| REF3-20-GN-11C  | 574205                            | 7853558  | 91.4          | 14-Aug-20 | 14-Aug-20 | 14:32    | 16:05     | 1.55          | 1.42                    | 0                                   | 3         | 0        | 3           | 2.12         |
| REF3-20-GN-11D  | 574205                            | 7853558  | 91.4          | 14-Aug-20 | 14-Aug-20 | 16:23    | 17:33     | 1.17          | 1.07                    | 0                                   | 0         | 0        | 0           | 0            |
| REF3-20-GN-12A  | 574050                            | 7853557  | 91.4          | 14-Aug-20 | 14-Aug-20 | 11:05    | 12:50     | 1.75          | 1.60                    | 0                                   | 0         | 1        | 1           | 0.625        |
| REF3-20-GN-12B  | 574050                            | 7853557  | 91.4          | 14-Aug-20 | 14-Aug-20 | 13:02    | 14:36     | 1.57          | 1.43                    | 0                                   | 2         | 0        | 2           | 1.40         |
| REF3-20-GN-12C  | 574050                            | 7853557  | 91.4          | 14-Aug-20 | 14-Aug-20 | 14:46    | 16:26     | 1.67          | 1.52                    | 1                                   | 2         | 0        | 3           | 1.97         |
| REF3-20-GN-12D  | 574050                            | 7853557  | 91.4          | 14-Aug-20 | 14-Aug-20 | 16:39    | 17:40     | 1.02          | 0.930                   | 0                                   | 0         | 0        | 0           | 0            |
| <b>Total</b>    |                                   |          |               |           |           |          |           |               | <b>63.0</b>             | <b>12</b>                           | <b>49</b> | <b>8</b> | <b>69</b>   | <b>0.956</b> |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m-hours of net.

**Table G.3: Summary of Arctic Charr Gill Net Catches by Mesh Size, Mary River Project CREMP, August 2020**

| Waterbody         | Effort<br>(m*hrs/100 m) | Arctic Charr Catch<br>Per Mesh Size |            |            | Total<br>Catch | CPUE        | Mortalities |
|-------------------|-------------------------|-------------------------------------|------------|------------|----------------|-------------|-------------|
|                   |                         | 1½"                                 | 2"         | 3"         |                |             |             |
| Reference Lake 3  | 63.0                    | 12                                  | 49         | 8          | 69             | 0.956       | 16          |
| Camp Lake         | 6.35                    | 13                                  | 35         | 46         | 94             | 14.8        | 18          |
| Sheardown Lake NW | 30.4                    | 17                                  | 56         | 25         | 98             | 3.34        | 21          |
| Sheardown Lake SE | 28.3                    | 20                                  | 42         | 45         | 107            | 3.81        | 27          |
| Mary Lake         | 21.4                    | 14                                  | 41         | 39         | 94             | 4.60        | 18          |
| <b>Total</b>      | <b>149.5</b>            | <b>76</b>                           | <b>223</b> | <b>163</b> | <b>462</b>     | <b>5.50</b> | <b>100</b>  |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

**Table G.4: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| REF3-20-ACJ-01 | 6.6              | 7.1               | 2.374           | -           | 0.826                         |
| REF3-20-ACJ-02 | 6.9              | 7.3               | 2.497           | -           | 0.760                         |
| REF3-20-ACJ-03 | 7.7              | 8.2               | 3.548           | -           | 0.777                         |
| REF3-20-ACJ-04 | 7.7              | 8.2               | 3.514           | -           | 0.770                         |
| REF3-20-ACJ-05 | 3.8              | 3.9               | 0.464           | -           | 0.846                         |
| REF3-20-ACJ-06 | 3.8              | 3.9               | 0.474           | -           | 0.864                         |
| REF3-20-ACJ-07 | 3.5              | 3.6               | 0.330           | -           | 0.770                         |
| REF3-20-ACJ-08 | 3.8              | 3.9               | 0.433           | -           | 0.789                         |
| REF3-20-ACJ-09 | 5.3              | 5.5               | 1.207           | -           | 0.811                         |
| REF3-20-ACJ-10 | 3.1              | 3.2               | 0.234           | -           | 0.785                         |
| REF3-20-ACJ-11 | 7.3              | 7.8               | 3.401           | -           | 0.874                         |
| REF3-20-ACJ-12 | 7.5              | 8.1               | 3.411           | -           | 0.809                         |
| REF3-20-ACJ-13 | 9.3              | 10.0              | 6.643           | -           | 0.826                         |
| REF3-20-ACJ-14 | 9.3              | 10.1              | 6.740           | -           | 0.838                         |
| REF3-20-ACJ-15 | 3.6              | 3.7               | 0.361           | -           | 0.774                         |
| REF3-20-ACJ-16 | 6.2              | 6.6               | 2.306           | -           | 0.968                         |
| REF3-20-ACJ-17 | 8.5              | 9.3               | 5.120           | -           | 0.834                         |
| REF3-20-ACJ-18 | 8.5              | 9.1               | 4.955           | -           | 0.807                         |
| REF3-20-ACJ-19 | 9.3              | 10.0              | 7.018           | -           | 0.872                         |
| REF3-20-ACJ-20 | 7.8              | 8.4               | 3.618           | -           | 0.762                         |
| REF3-20-ACJ-21 | 3.5              | 3.6               | 0.329           | -           | 0.767                         |
| REF3-20-ACJ-22 | 5.5              | 5.8               | 1.566           | -           | 0.941                         |
| REF3-20-ACJ-23 | 8.1              | 8.8               | 4.593           | -           | 0.864                         |
| REF3-20-ACJ-24 | 8.7              | 9.3               | 5.003           | -           | 0.760                         |
| REF3-20-ACJ-25 | 7.6              | 8.2               | 3.825           | -           | 0.871                         |
| REF3-20-ACJ-26 | 7.3              | 7.9               | 3.225           | -           | 0.829                         |
| REF3-20-ACJ-27 | 3.6              | 3.7               | 0.420           | 0           | 0.900                         |
| REF3-20-ACJ-28 | 3.2              | 3.3               | 0.265           | 0           | 0.809                         |
| REF3-20-ACJ-29 | 5.2              | 5.4               | 1.146           | 1           | 0.815                         |
| REF3-20-ACJ-30 | 6.1              | 6.5               | 1.722           | 1           | 0.759                         |
| REF3-20-ACJ-31 | 7.6              | 8.1               | 3.387           | 2           | 0.772                         |
| REF3-20-ACJ-32 | 7.8              | 8.4               | 4.526           | 3           | 0.954                         |
| REF3-20-ACJ-33 | 7.6              | 8.1               | 3.534           | 2           | 0.805                         |
| REF3-20-ACJ-34 | 8.4              | 9.0               | 5.972           | 3           | 1.008                         |
| REF3-20-ACJ-35 | 10.8             | 11.7              | 9.803           | 3           | 0.778                         |
| REF3-20-ACJ-36 | 16.0             | 17.3              | 38.457          | 6           | 0.939                         |
| REF3-20-ACJ-37 | 3.3              | 3.4               | 0.249           | -           | 0.693                         |
| REF3-20-ACJ-38 | 7.9              | 8.6               | 4.419           | -           | 0.896                         |
| REF3-20-ACJ-39 | 7.8              | 8.3               | 3.971           | -           | 0.837                         |
| REF3-20-ACJ-40 | 17.5             | 19.0              | 46.623          | -           | 0.870                         |
| REF3-20-ACJ-41 | 6.8              | 7.3               | 2.607           | -           | 0.829                         |
| REF3-20-ACJ-42 | 6.5              | 7.0               | 2.305           | -           | 0.839                         |
| REF3-20-ACJ-43 | 3.6              | 3.7               | 0.383           | -           | 0.821                         |
| REF3-20-ACJ-44 | 7.1              | 7.6               | 2.950           | -           | 0.824                         |
| REF3-20-ACJ-45 | 4.3              | 4.4               | 0.555           | -           | 0.698                         |
| REF3-20-ACJ-46 | 5.7              | 6.0               | 1.667           | -           | 0.900                         |
| REF3-20-ACJ-47 | 8.8              | 9.5               | 5.587           | -           | 0.820                         |
| REF3-20-ACJ-48 | 6.5              | 7.0               | 2.306           | -           | 0.840                         |
| REF3-20-ACJ-49 | 7.5              | 8.0               | 3.624           | -           | 0.859                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.4: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID     | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|-----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| REF3-20-ACJ-50  | 9.7              | 10.4              | 7.506           | -           | 0.822                         |
| REF3-20-ACJ-51  | 6.9              | 7.4               | 2.715           | -           | 0.826                         |
| REF3-20-ACJ-52  | 6.1              | 6.4               | 1.876           | -           | 0.827                         |
| REF3-20-ACJ-53  | 6.8              | 7.3               | 2.589           | -           | 0.823                         |
| REF3-20-ACJ-54  | 3.2              | 3.3               | 0.250           | -           | 0.763                         |
| REF3-20-ACJ-55  | 3.8              | 4.0               | 0.596           | -           | 1.086                         |
| REF3-20-ACJ-56  | 3.3              | 3.4               | 0.276           | -           | 0.768                         |
| REF3-20-ACJ-57  | 7.8              | 8.3               | 4.133           | -           | 0.871                         |
| REF3-20-ACJ-58  | 5.3              | 5.6               | 1.171           | -           | 0.787                         |
| REF3-20-ACJ-59  | 8.2              | 8.8               | 5.716           | -           | 1.037                         |
| REF3-20-ACJ-60  | 6.0              | 6.4               | 1.785           | -           | 0.826                         |
| REF3-20-ACJ-61  | 8.0              | 8.6               | 4.441           | -           | 0.867                         |
| REF3-20-ACJ-62  | 3.8              | 3.9               | 0.418           | -           | 0.762                         |
| REF3-20-ACJ-63  | 6.6              | 7.0               | 2.491           | -           | 0.866                         |
| REF3-20-ACJ-64  | 4.3              | 4.5               | 0.710           | -           | 0.893                         |
| REF3-20-ACJ-65  | 9.0              | 9.7               | 5.839           | -           | 0.801                         |
| REF3-20-ACJ-66  | 10.4             | 11.2              | 8.930           | -           | 0.794                         |
| REF3-20-ACJ-67  | 6.5              | 6.9               | 2.319           | -           | 0.844                         |
| REF3-20-ACJ-68  | 5.7              | 6.1               | 1.842           | -           | 0.995                         |
| REF3-20-ACJ-69  | 7.2              | 7.7               | 2.869           | -           | 0.769                         |
| REF3-20-ACJ-70  | 9.4              | 10.1              | 6.535           | -           | 0.787                         |
| REF3-20-ACJ-71  | 7.5              | 8.2               | 3.360           | -           | 0.796                         |
| REF3-20-ACJ-72  | 13.3             | 14.2              | 21.380          | -           | 0.909                         |
| REF3-20-ACJ-73  | 3.7              | 3.8               | 0.389           | -           | 0.768                         |
| REF3-20-ACJ-74  | 6.9              | 7.4               | 2.580           | -           | 0.785                         |
| REF3-20-ACJ-75  | 6.7              | 7.2               | 2.377           | -           | 0.790                         |
| REF3-20-ACJ-76  | 7.8              | 8.3               | 3.865           | -           | 0.814                         |
| REF3-20-ACJ-77  | 7.1              | 7.5               | 2.568           | -           | 0.717                         |
| REF3-20-ACJ-78  | 8.6              | 9.1               | 5.214           | -           | 0.820                         |
| REF3-20-ACJ-79  | 8.0              | 8.6               | 4.073           | -           | 0.796                         |
| REF3-20-ACJ-80  | 9.3              | 9.9               | 5.988           | -           | 0.744                         |
| REF3-20-ACJ-81  | 9.2              | 9.9               | 6.163           | -           | 0.791                         |
| REF3-20-ACJ-82  | 7.3              | 7.8               | 3.094           | -           | 0.795                         |
| REF3-20-ACJ-83  | 7.7              | 8.2               | 3.463           | -           | 0.759                         |
| REF3-20-ACJ-84  | 3.8              | 3.9               | 0.408           | -           | 0.744                         |
| REF3-20-ACJ-85  | 5.7              | 6.0               | 1.641           | -           | 0.886                         |
| REF3-20-ACJ-86  | 7.4              | 7.9               | 3.226           | -           | 0.796                         |
| REF3-20-ACJ-87  | 10.5             | 11.3              | 9.575           | -           | 0.827                         |
| REF3-20-ACJ-88  | 7.7              | 8.2               | 3.765           | -           | 0.825                         |
| REF3-20-ACJ-89  | 8.0              | 8.6               | 3.992           | -           | 0.780                         |
| REF3-20-ACJ-90  | 7.1              | 7.6               | 2.688           | -           | 0.751                         |
| REF3-20-ACJ-91  | 6.7              | 7.1               | 2.332           | -           | 0.775                         |
| REF3-20-ACJ-92  | 6.4              | 6.8               | 2.195           | -           | 0.837                         |
| REF3-20-ACJ-93  | 10.4             | 11.2              | 8.924           | -           | 0.793                         |
| REF3-20-ACJ-94  | 11.6             | 12.5              | 12.139          | -           | 0.778                         |
| REF3-20-ACJ-95  | 9.7              | 10.4              | 7.013           | -           | 0.768                         |
| REF3-20-ACJ-96  | 9.5              | 10.2              | 6.383           | -           | 0.744                         |
| REF3-20-ACJ-97  | 8.0              | 8.5               | 4.064           | -           | 0.794                         |
| REF3-20-ACJ-98  | 3.2              | 3.3               | 0.232           | -           | 0.708                         |
| REF3-20-ACJ-99  | 3.5              | 3.6               | 0.373           | -           | 0.870                         |
| REF3-20-ACJ-100 | 5.7              | 6.0               | 1.405           | 1           | 0.759                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.4: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID                     |                    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------------------------|--------------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| Overall Catch Summary           | Sample Size (N)    | 100              | 100               | 100             | 11          | 100                           |
|                                 | Average            | 7.1              | 7.5               | 4.235           | 2.0         | 0.822                         |
|                                 | Median             | 7.3              | 7.8               | 3.022           | 2.0         | 0.813                         |
|                                 | Standard Deviation | 2.6              | 2.8               | 6.318           | 1.7         | 0.069                         |
|                                 | Standard Error     | 0.26             | 0.28              | 0.632           | 0.52        | 0.007                         |
|                                 | Minimum            | 3.1              | 3.2               | 0.232           | 0           | 0.693                         |
|                                 | Maximum            | 17.5             | 19.0              | 46.623          | 6           | 1.086                         |
| Young-of-the-Year Catch Summary | proportion of YOY  | 21%              |                   |                 |             |                               |
|                                 | Sample Size (N)    | 21               | 21                | 21              | 2           | 21                            |
|                                 | Average            | 3.6              | 3.7               | 0.388           | 0           | 0.804                         |
|                                 | Median             | 3.6              | 3.7               | 0.383           | 0           | 0.774                         |
|                                 | Standard Deviation | 0.3              | 0.3               | 0.125           | -           | 0.088                         |
|                                 | Standard Error     | 0.1              | 0.1               | 0.027           | -           | 0.019                         |
|                                 | Minimum            | 3.1              | 3.2               | 0.232           | 0           | 0.693                         |
|                                 | Maximum            | 4.3              | 4.5               | 0.710           | 0           | 1.086                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.5: Arctic Charr Measurements from Fish Captured at Camp Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID   | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| JLO-20-ACJ-01 | 9.3              | 10.1              | 7.186           | -           | 0.893                         |
| JLO-20-ACJ-02 | 4.3              | 4.5               | 0.729           | -           | 0.917                         |
| JLO-20-ACJ-03 | 11.2             | 12.2              | 13.732          | -           | 0.977                         |
| JLO-20-ACJ-04 | 13.0             | 14.0              | 16.986          | -           | 0.773                         |
| JLO-20-ACJ-05 | 7.1              | 7.6               | 4.186           | -           | 1.170                         |
| JLO-20-ACJ-06 | 8.5              | 9.2               | 5.197           | -           | 0.846                         |
| JLO-20-ACJ-07 | 9.3              | 10.1              | 6.998           | -           | 0.870                         |
| JLO-20-ACJ-08 | 9.8              | 10.5              | 8.531           | -           | 0.906                         |
| JLO-20-ACJ-09 | 7.2              | 7.6               | 3.510           | -           | 0.940                         |
| JLO-20-ACJ-10 | 7.8              | 8.3               | 4.064           | -           | 0.856                         |
| JLO-20-ACJ-11 | 8.5              | 9.2               | 6.695           | -           | 1.090                         |
| JLO-20-ACJ-12 | 8.3              | 8.8               | 4.908           | -           | 0.858                         |
| JLO-20-ACJ-13 | 8.2              | 8.9               | 5.841           | -           | 1.059                         |
| JLO-20-ACJ-14 | 11.1             | 12.0              | 12.446          | -           | 0.910                         |
| JLO-20-ACJ-15 | 7.1              | 7.5               | 2.833           | -           | 0.792                         |
| JLO-20-ACJ-16 | 7.9              | 8.4               | 4.044           | -           | 0.820                         |
| JLO-20-ACJ-17 | 9.8              | 10.5              | 7.502           | -           | 0.797                         |
| JLO-20-ACJ-18 | 7.5              | 8.1               | 3.902           | -           | 0.925                         |
| JLO-20-ACJ-19 | 9.5              | 10.3              | 8.743           | -           | 1.020                         |
| JLO-20-ACJ-20 | 12.8             | 13.9              | 17.405          | -           | 0.830                         |
| JLO-20-ACJ-21 | 9.6              | 10.3              | 7.735           | -           | 0.874                         |
| JLO-20-ACJ-22 | 9.8              | 10.5              | 8.475           | -           | 0.900                         |
| JLO-20-ACJ-23 | 8.0              | 8.5               | 4.253           | -           | 0.831                         |
| JLO-20-ACJ-24 | 10.3             | 11.1              | 9.037           | 2           | 0.827                         |
| JLO-20-ACJ-25 | 10.9             | 11.8              | 11.322          | 2           | 0.874                         |
| JLO-20-ACJ-26 | 9.1              | 9.7               | 5.705           | -           | 0.757                         |
| JLO-20-ACJ-27 | 9.9              | 10.7              | 8.577           | -           | 0.884                         |
| JLO-20-ACJ-28 | 7.7              | 8.2               | 4.786           | -           | 1.048                         |
| JLO-20-ACJ-29 | 7.8              | 8.3               | 4.034           | -           | 0.850                         |
| JLO-20-ACJ-30 | 10.1             | 10.8              | 7.973           | -           | 0.774                         |
| JLO-20-ACJ-31 | 7.0              | 7.4               | 2.895           | -           | 0.844                         |
| JLO-20-ACJ-32 | 8.5              | 9.2               | 5.711           | -           | 0.930                         |
| JLO-20-ACJ-33 | 10.7             | 11.5              | 9.929           | -           | 0.811                         |
| JLO-20-ACJ-34 | 7.2              | 7.7               | 3.296           | -           | 0.883                         |
| JLO-20-ACJ-35 | 7.2              | 7.6               | 3.315           | -           | 0.888                         |
| JLO-20-ACJ-36 | 10.6             | 11.5              | 11.713          | -           | 0.983                         |
| JLO-20-ACJ-37 | 7.5              | 8.1               | 3.810           | -           | 0.903                         |
| JLO-20-ACJ-38 | 7.4              | 7.8               | 2.906           | -           | 0.717                         |
| JLO-20-ACJ-39 | 8.1              | 8.6               | 4.490           | -           | 0.845                         |
| JLO-20-ACJ-40 | 5.8              | 6.1               | 1.664           | -           | 0.853                         |
| JLO-20-ACJ-41 | 7.4              | 7.9               | 3.868           | -           | 0.955                         |
| JLO-20-ACJ-42 | 7.6              | 8.2               | 3.534           | -           | 0.805                         |
| JLO-20-ACJ-43 | 7.8              | 8.4               | 4.740           | -           | 0.999                         |
| JLO-20-ACJ-44 | 8.8              | 9.4               | 6.283           | -           | 0.922                         |
| JLO-20-ACJ-45 | 10.4             | 11.2              | 9.964           | -           | 0.886                         |
| JLO-20-ACJ-46 | 6.7              | 7.2               | 3.416           | -           | 1.136                         |
| JLO-20-ACJ-47 | 6.4              | 6.7               | 2.324           | -           | 0.887                         |
| JLO-20-ACJ-48 | 11.8             | 12.7              | 14.093          | -           | 0.858                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.5: Arctic Charr Measurements from Fish Captured at Camp Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| JLO-20-ACJ-49  | 9.2              | 9.8               | 7.143           | -           | 0.917                         |
| JLO-20-ACJ-50  | 8.6              | 9.2               | 6.426           | -           | 1.010                         |
| JLO-20-ACJ-51  | 6.3              | 6.6               | 2.045           | 1           | 0.818                         |
| JLO-20-ACJ-52  | 16.3             | 18.2              | 37.810          | 4           | 0.873                         |
| JLO-20-ACJ-53  | 8.9              | 9.5               | 5.688           | -           | 0.807                         |
| JLO-20-ACJ-54  | 8.3              | 8.9               | 4.819           | -           | 0.843                         |
| JLO-20-ACJ-55  | 8.6              | 9.1               | 5.014           | -           | 0.788                         |
| JLO-20-ACJ-56  | 9.6              | 10.3              | 7.905           | -           | 0.893                         |
| JLO-20-ACJ-57  | 6.6              | 7.0               | 2.557           | -           | 0.889                         |
| JLO-20-ACJ-58  | 3.8              | 4.0               | 0.448           | -           | 0.816                         |
| JLO-20-ACJ-59  | 7.3              | 7.7               | 3.275           | -           | 0.842                         |
| JLO-20-ACJ-60  | 10.7             | 11.5              | 11.206          | -           | 0.915                         |
| JLO-20-ACJ-61  | 8.3              | 8.8               | 5.126           | -           | 0.896                         |
| JLO-20-ACJ-62  | 6.4              | 6.8               | 2.429           | -           | 0.927                         |
| JLO-20-ACJ-63  | 8.2              | 8.6               | 4.046           | -           | 0.734                         |
| JLO-20-ACJ-64  | 14.7             | 15.9              | 25.966          | -           | 0.817                         |
| JLO-20-ACJ-65  | 12.5             | 13.6              | 16.247          | -           | 0.832                         |
| JLO-20-ACJ-66  | 8.4              | 8.9               | 5.073           | -           | 0.856                         |
| JLO-20-ACJ-67  | 7.5              | 8.0               | 5.612           | -           | 1.33                          |
| JLO-20-ACJ-68  | 8.2              | 8.7               | 4.992           | -           | 0.905                         |
| JLO-20-ACJ-69  | 8.4              | 9.0               | 4.766           | -           | 0.804                         |
| JLO-20-ACJ-70  | 7.5              | 8.0               | 4.079           | -           | 0.967                         |
| JLO-20-ACJ-71  | 6.5              | 7.0               | 2.307           | -           | 0.840                         |
| JLO-20-ACJ-72  | 7.9              | 8.4               | 4.366           | -           | 0.886                         |
| JLO-20-ACJ-73  | 11.2             | 12.1              | 12.801          | -           | 0.911                         |
| JLO-20-ACJ-74  | 12.3             | 13.3              | 18.347          | 3           | 0.986                         |
| JLO-20-ACJ-75  | 6.5              | 6.9               | 2.467           | 1           | 0.898                         |
| JLO-20-ACJ-76  | 8.0              | 8.5               | 4.587           | 1           | 0.896                         |
| JLO-20-ACJ-77  | 7.6              | 8.2               | 4.553           | 1           | 1.037                         |
| JLO-20-ACJ-78  | 10.5             | 11.3              | 8.709           | 3           | 0.752                         |
| JLO-20-ACJ-79  | 10.7             | 11.5              | 10.053          | 2           | 0.821                         |
| JLO-20-ACJ-80  | 6.5              | 6.8               | 2.660           | -           | 0.969                         |
| JLO-20-ACJ-81  | 6.3              | 6.6               | 2.387           | -           | 0.955                         |
| JLO-20-ACJ-82  | 8.3              | 8.8               | 4.620           | -           | 0.808                         |
| JLO-20-ACJ-83  | 7.1              | 7.4               | 3.145           | -           | 0.879                         |
| JLO-20-ACJ-84  | 13.1             | 14.2              | 18.222          | -           | 0.811                         |
| JLO-20-ACJ-85  | 10.7             | 11.7              | 11.668          | -           | 0.952                         |
| JLO-20-ACJ-86  | 7.3              | 7.8               | 3.259           | -           | 0.838                         |
| JLO-20-ACJ-87  | 7.1              | 7.5               | 3.077           | -           | 0.860                         |
| JLO-20-ACJ-88  | 8.2              | 8.8               | 5.174           | -           | 0.938                         |
| JLO-20-ACJ-89  | 7.8              | 8.4               | 4.002           | -           | 0.843                         |
| JLO-20-ACJ-90  | 8.7              | 9.3               | 5.544           | -           | 0.842                         |
| JLO-20-ACJ-91  | 9.7              | 10.3              | 7.831           | -           | 0.858                         |
| JLO-20-ACJ-92  | 7.9              | 8.5               | 4.623           | -           | 0.938                         |
| JLO-20-ACJ-93  | 12.0             | 12.9              | 15.662          | -           | 0.906                         |
| JLO-20-ACJ-94  | 8.7              | 9.3               | 5.680           | -           | 0.863                         |
| JLO-20-ACJ-95  | 11.3             | 12.2              | 12.209          | -           | 0.846                         |
| JLO-20-ACJ-96  | 8.2              | 8.7               | 4.572           | -           | 0.829                         |
| JLO-20-ACJ-97  | 8.2              | 8.7               | 4.841           | -           | 0.878                         |
| JLO-20-ACJ-98  | 11.6             | 12.6              | 13.096          | -           | 0.839                         |
| JLO-20-ACJ-99  | 7.3              | 7.8               | 3.620           | -           | 0.931                         |
| JLO-20-ACJ-100 | 12.4             | 13.2              | 15.353          | -           | 0.805                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.5: Arctic Charr Measurements from Fish Captured at Camp Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID                     |                    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------------------------|--------------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| Overall Catch Summary           | Sample Size (N)    | 100              | 100               | 100             | 10          | 100                           |
|                                 | Average            | 8.8              | 9.5               | 7.074           | 2.0         | 0.889                         |
|                                 | Median             | 8.3              | 8.9               | 5.044           | 2.0         | 0.876                         |
|                                 | Standard Deviation | 2.1              | 2.3               | 5.524           | 1.1         | 0.092                         |
|                                 | Standard Error     | 0.21             | 0.23              | 0.552           | 0.33        | 0.009                         |
|                                 | Minimum            | 3.8              | 4.0               | 0.448           | 1.0         | 0.717                         |
|                                 | Maximum            | 16.3             | 18.2              | 37.810          | 4.0         | 1.330                         |
| Young-of-the-Year Catch Summary | proportion of YOY  | 2%               |                   |                 |             |                               |
|                                 | Sample Size (N)    | 2                | 2                 | 2               | 0           | 2                             |
|                                 | Average            | 0.0              | 0.0               | 0.000           | 0           | 0.000                         |
|                                 | Median             | 0.0              | 0.0               | 0.000           | 0           | 0.000                         |
|                                 | Standard Deviation | 0.0              | 0.0               | 0.000           | -           | 0.000                         |
|                                 | Standard Error     | 0.0              | 0.0               | 0.000           | -           | 0.000                         |
|                                 | Minimum            | 3.8              | 4.0               | 0.448           | 0           | 0.816                         |
|                                 | Maximum            | 4.3              | 4.5               | 0.729           | 0           | 0.917                         |

Note: "-" indicates measurement not taken or no comment.



**Table G.6: Results of Nearshore Arctic Charr Non-Young-of-the-Year (YOY) Health Endpoint Statistical Comparisons between Camp Lake (JLO) and Reference Lake 3 (REF), Mary River Project CREMP, August 2020**

| Group    | Indicator                | Endpoint                      | Variables            |                       | Sample Size |                 | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |      |      | Test P-value | MOD (%) <sup>c,d</sup> |
|----------|--------------------------|-------------------------------|----------------------|-----------------------|-------------|-----------------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|------|------|--------------|------------------------|
|          |                          |                               | Response             | Covariate             | REF         | JLO             |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |      |      |              |                        |
|          |                          |                               |                      |                       |             |                 |        | Interaction P-value     | Covariate P-value    |                                              |                                 |      |      |              |                        |
| All Fish | Recruitment/<br>Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 100         | 100             | K-S    | -                       | -                    | -                                            | -                               | -    | -    | <0.001       | -                      |
| Non-YOY  | Survival                 | Length Frequency Distribution | Fork Length (cm)     | -                     | 79          | 98              | K-S    | -                       | -                    | -                                            | -                               | -    | -    | 0.003        | -                      |
|          | Body Size                | Fork Length                   | Fork Length (cm)     | -                     | 79          | 98              | M-W    | -                       | -                    | -                                            | Median                          | 7.70 | 8.30 | <0.001       | 7.8                    |
|          |                          | Body Weight                   | Body Weight (g)      | -                     | 79          | 98              | M-W    | -                       | -                    | -                                            | Median                          | 3.55 | 5.10 | <0.001       | 44                     |
|          | Energy Storage           | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 79          | 98              | ANCOVA | 0.110                   | <0.001               | 8.28                                         | Adjusted Mean                   | 4.66 | 5.03 | <0.001       | 7.9                    |
|          |                          | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 79          | 97 <sup>e</sup> | ANCOVA | 0.147                   | <0.001               | 8.28                                         | Adjusted Mean                   | 4.67 | 5.02 | <0.001       | 7.4                    |

Area P-value < 0.1 or Interaction P-value < 0.05

Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

Notes: YOY = young-of-year. MOD = magnitude of difference.

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CFRDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

<sup>e</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R<sup>2</sup> of interaction model = 0.9884 and R<sup>2</sup> of parallel slope model = 0.9882; a difference < 0.02) following Environment Canada (2012).

<sup>f</sup> One outlier (JLO-20-ACJ-67, Stdnt resid: 4.474) removed from analysis.

<sup>g</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R<sup>2</sup> of interaction model = 0.9894 and R<sup>2</sup> of parallel slope model = 0.9892; a difference < 0.02) following Environment Canada (2012).

**Table G.7: Results of Nearshore Arctic Charr Non-Young-of-the-Year (Non-YOY) Health Endpoint Statistical Comparisons between Samples Collected in 2020 and the Baseline Period at Individual Mine-Exposed Lakes, Mary River Project 2020 CREMP**

| Lake                               | Group   | Indicator             | Endpoint                      | Variables             |                       | Sample Size     |                 | Test     | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |          |      | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|------------------------------------|---------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------|-----------------|----------|-------------------------|----------------------|----------------------------------------------|---------------------------------|----------|------|--------------|--------------------------------------------|
|                                    |         |                       |                               | Response              | Covariate             | Baseline        | 2020            |          | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |          |      |              |                                            |
|                                    |         |                       |                               |                       |                       |                 |                 |          | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | Baseline | 2020 |              |                                            |
| Camp (JLO)                         | Non-YOY | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)      | -                     | 51              | 98              | K-S      | -                       | -                    | -                                            | -                               | -        | -    | <0.001       | -                                          |
|                                    |         | Body Size             | Fork Length                   | Fork Length (cm)      | -                     | 51              | 98              | tunequal | -                       | -                    | -                                            | Geometric Mean                  | 11.2     | 8.72 | <0.001       | -22                                        |
|                                    |         |                       | Body Weight                   | Body Weight(g)        | -                     | 51              | 98              | tunequal | -                       | -                    | -                                            | Geometric Mean                  | 12.3     | 5.87 | <0.001       | -52                                        |
|                                    |         | Energy Storage        | Condition                     | log[Body Weight (g)]  | log[Fork Length (cm)] | 51              | 98              | ANCOVA   | 0.39                    | <0.001               | 9.5                                          | Adjusted Mean                   | 7.66     | 7.51 | 0.302        | -                                          |
|                                    |         |                       | Condition                     | log[Body Weight (g)]  | log[Fork Length (cm)] | 51              | 97 <sup>e</sup> | ANCOVA   | 0.254                   | <0.001               | 9.52                                         | Adjusted Mean                   | 7.69     | 7.52 | 0.220        | -                                          |
| Sheardown NW (DLO-01)              | Non-YOY | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)      | -                     | 244             | 85              | K-S      | -                       | -                    | -                                            | -                               | -        | -    | <0.001       | -                                          |
|                                    |         | Body Size             | Fork Length                   | Fork Length (cm)      | -                     | 244             | 85              | M-W      | -                       | -                    | -                                            | Median                          | 8.30     | 9.40 | 0.074        | 13                                         |
|                                    |         |                       | Body Weight                   | Body Weight (g)       | -                     | 244             | 85              | M-W      | -                       | -                    | -                                            | Median                          | 6.00     | 7.05 | 0.316        | -                                          |
|                                    |         | Energy Storage        | Condition                     | log[Body Weight (g)]  | log[Fork Length (cm)] | 244             | 85              | ANCOVA   | 0.921                   | <0.001               | 9.29                                         | Adjusted Mean                   | 7.91     | 7.23 | <0.001       | -8.6                                       |
| Sheardown SE (DLO-02) <sup>g</sup> | Non-YOY | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)      | -                     | 16              | 76              | K-S      | -                       | -                    | -                                            | -                               | -        | -    | <0.001       | -87                                        |
|                                    |         | Body Size             | Fork Length                   | log[Fork Length (cm)] | -                     | 16              | 76              | M-W      | -                       | -                    | -                                            | Median                          | 6.30     | 8.20 | <0.001       | 30                                         |
|                                    |         |                       | Body Weight                   | Body Weight(g)        | -                     | 16              | 76              | M-W      | -                       | -                    | -                                            | Median                          | 2.50     | 5.43 | <0.001       | 117                                        |
|                                    |         | Energy Storage        | Condition                     | log[Body Weight (g)]  | log[Fork Length (cm)] | 16              | 76              | ANCOVA   | <0.001 <sup>f</sup>     | <0.001               | 8.09                                         | Adjusted Mean                   | 4.84     | 4.98 | 0.496        | -                                          |
|                                    |         |                       | Condition                     | log[Body Weight (g)]  | log[Fork Length (cm)] | 14 <sup>g</sup> | 76              | ANCOVA   | <0.001 <sup>h</sup>     | <0.001               | 8.16                                         | Adjusted Mean                   | 5.23     | 5.12 | 0.519        | -                                          |

 Area P-value < 0.1 or Interaction P-value < 0.05.

 Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint).

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(2018 mean - baseline mean) / baseline area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(2018 predicted mean - baseline predicted mean) / baseline predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between groups. A negative difference implies that 2018 has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that 2017 has fewer fish less than the length where the maximum difference in CFRDs was observed.

<sup>e</sup> One outlier (JLO-20-ACJ-67, Stdnt resid: 4.277) removed from analysis.

<sup>f</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9687 and R2 of parallel slope model = 0.9583; a difference < 0.02) following Environment Canada (2012).

<sup>g</sup> One outlier (SLSE-07-1 Stdnt resid:-4.398; SLSE-07-2 Stdnt resid: -4.398) removed from analysis.

<sup>h</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9687 and R2 of parallel slope model = 0.9583; a difference < 0.02) following Environment Canada (2012).

**Table G.8: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Camp Lake Using 2020 Data Relative to Reference Lake 3 Data (2020) or Camp Lake Baseline Data (2006 to 2013) with  $\alpha=\beta=0.1$ , Mary River Project 2020 CREMP**

| Comparison                                                                   | Group    | Indicator      | Endpoint               | Variables                     |                       | Test <sup>a</sup> | S <sup>b</sup> | COV (%) <sup>c</sup> | Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1 |          |       |      |      |      |      |      |      |      |
|------------------------------------------------------------------------------|----------|----------------|------------------------|-------------------------------|-----------------------|-------------------|----------------|----------------------|-------------------------------------------------------------------------------------------------------|----------|-------|------|------|------|------|------|------|------|
|                                                                              |          |                |                        | Response                      | Covariate             |                   |                |                      | log(Response)                                                                                         | 5%       | 10%   | 20%  | 25%  | 30%  | 33%  | 40%  | 50%  | 100% |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | -5%      | -9%   | -17% | -20% | -23% | -25% | -29% | -33% | -50% |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | Response | ±5%   | ±10% | ±20% | ±25% | ±30% | ±33% | ±40% | ±50% |
| Nearshore Arctic Charr (Electrofishing) versus Ref. Lake 3, 2020 Data        | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0941         | 25.4                 | Response                                                                                              | 393      | 105   | 29   | 20   | 16   | 13   | 10   | 7    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.28           | 116                  | Response                                                                                              | 3,469    | 910   | 250  | 167  | 122  | 101  | 75   | 53   | 19   |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0378         | -                    | log(Response)                                                                                         | 57       | 17    | 6    | 5    | 4    | 4    | 4    | 4    | 3    |
|                                                                              |          |                | Condition <sup>d</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0355         | -                    | log(Response)                                                                                         | 50       | 15    | 6    | 5    | 4    | 4    | 4    | 3    | 3    |
| Nearshore Arctic Charr (Electrofishing) 2020 versus Baseline                 | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)              | -                     | tunequal          | 0.110          | -                    | Response                                                                                              | 463      | 122   | 34   | 23   | 17   | 15   | 11   | 8    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | tunequal          | 0.319          | -                    | Response                                                                                              | 3,886    | 1,019 | 279  | 187  | 136  | 113  | 83   | 57   | 20   |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0425         | -                    | log(Response)                                                                                         | 71       | 20    | 7    | 6    | 5    | 5    | 4    | 4    | 3    |
|                                                                              |          |                | Condition <sup>d</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0403         | -                    | log(Response)                                                                                         | 64       | 18    | 7    | 5    | 5    | 4    | 4    | 4    | 3    |
| Littoral/Profundal Arctic Charr (Gill Netting) versus Ref. Lake 3, 2020 Data | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0804         | 20.9                 | Response                                                                                              | 288      | 77    | 22   | 16   | 12   | 10   | 7    | 5    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.246          | 83.1                 | Response                                                                                              | 2,671    | 701   | 193  | 129  | 94   | 79   | 58   | 41   | 16   |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0417         | -                    | log(Response)                                                                                         | 69       | 20    | 7    | 6    | 5    | 4    | 4    | 4    | 3    |
|                                                                              |          |                | Condition <sup>d</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0386         | -                    | log(Response)                                                                                         | 59       | 17    | 6    | 5    | 4    | 4    | 4    | 4    | 3    |
| Littoral/Profundal Arctic Charr (Gill Netting) 2020 versus Baseline          | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0915         | 21.9                 | Response                                                                                              | 371      | 98    | 26   | 17   | 12   | 11   | 7    | 6    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.277          | 99.1                 | Response                                                                                              | 3,396    | 892   | 245  | 164  | 120  | 100  | 73   | 51   | 19   |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0664         | -                    | log(Response)                                                                                         | 170      | 46    | 14   | 10   | 8    | 7    | 6    | 5    | 4    |

<sup>a</sup> Sample size estimates for the M-W test were estimated based for a two-sample t-test using sample sizes multiplied by 0.864. The 0.864 is the lower bound of the asymptotic relative efficiency of the Mann-Whitney test and the two-sample t-test (Hodges and Lehmann 1956). Estimates were generated for the response variable on the untransformed and log<sub>10</sub>-transformed scales and the lowest sample size is reported.

<sup>b</sup> Pooled standard deviation of the regression residuals

<sup>c</sup> Coefficient of variation (pooled standard deviation/reference mean)×100%

<sup>d</sup> Outliers removed from analysis.

**Table G.9: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID   | Net ID      | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities | Fulton's Condition Factor (K) |
|---------------|-------------|------------------------|------------------|-------------------|-----------------|---------------|-------------------------------|
| REF3-20-AC-01 | REF3-GN-1A  | 2                      | 33.1             | 35.1              | 210             | -             | 0.579                         |
| REF3-20-AC-02 | REF3-GN-1A  | 2                      | 32.4             | 35.0              | 295             | Mortality     | 0.867                         |
| REF3-20-AC-03 | REF3-GN-1A  | 2                      | 29.3             | 31.5              | 125             | -             | 0.497                         |
| REF3-20-AC-04 | REF3-GN-1A  | 2                      | 33.4             | 36.4              | 245             | -             | 0.658                         |
| REF3-20-AC-05 | REF3-GN-2A  | 2                      | 25.7             | 28.1              | 140             | -             | 0.825                         |
| REF3-20-AC-06 | REF3-GN-2A  | 2                      | 29.0             | 31.2              | 185             | -             | 0.759                         |
| REF3-20-AC-07 | REF3-GN-2A  | 2                      | 33.3             | 35.6              | 275             | Mortality     | 0.745                         |
| REF3-20-AC-08 | REF3-GN-3A  | 2                      | 29.8             | 32.3              | 205             | -             | 0.775                         |
| REF3-20-AC-09 | REF3-GN-3A  | 2                      | 30.6             | 33.0              | 215             | Mortality     | 0.750                         |
| REF3-20-AC-10 | REF3-GN-3A  | 2                      | 25.2             | 27.4              | 125             | Mortality     | 0.781                         |
| REF3-20-AC-11 | REF3-GN-3A  | 2                      | 30.6             | 33.3              | 220             | -             | 0.768                         |
| REF3-20-AC-12 | REF3-GN-3A  | 2                      | 32.4             | 34.8              | 285             | -             | 0.838                         |
| REF3-20-AC-13 | REF3-GN-4A  | 1½                     | 22.0             | 23.8              | 90              | Mortality     | 0.845                         |
| REF3-20-AC-14 | REF3-GN-5A  | 2                      | 27.7             | 30.1              | 154             | -             | 0.725                         |
| REF3-20-AC-15 | REF3-GN-5A  | 2                      | 27.6             | 30.0              | 172             | -             | 0.818                         |
| REF3-20-AC-16 | REF3-GN-5A  | 2                      | 30.9             | 33.1              | 205             | -             | 0.695                         |
| REF3-20-AC-17 | REF3-GN-5A  | 2                      | 30.3             | 32.6              | 202             | Mortality     | 0.726                         |
| REF3-20-AC-18 | REF3-GN-5A  | 1½                     | 26.8             | 29.0              | 150             | -             | 0.779                         |
| REF3-20-AC-19 | REF3-GN-5A  | 1½                     | 25.9             | 28.6              | 160             | -             | 0.921                         |
| REF3-20-AC-20 | REF3-GN-5A  | 1½                     | 25.4             | 27.7              | 128             | -             | 0.781                         |
| REF3-20-AC-21 | REF3-GN-6A  | 3                      | 57.0             | 60.5              | 1,720           | Mortality     | 0.929                         |
| REF3-20-AC-22 | REF3-GN-2B  | 1½                     | 22.3             | 24.2              | 96              | -             | 0.866                         |
| REF3-20-AC-23 | REF3-GN-1B  | 2                      | 28.0             | 30.4              | 205             | -             | 0.934                         |
| REF3-20-AC-24 | REF3-GN-1B  | 2                      | 29.8             | 32.5              | 225             | -             | 0.850                         |
| REF3-20-AC-25 | REF3-GN-3B  | 1½                     | 32.5             | 35.5              | 295             | Mortality     | 0.859                         |
| REF3-20-AC-26 | REF3-GN-6B  | 2                      | 24.9             | 27.1              | 128             | -             | 0.829                         |
| REF3-20-AC-27 | REF3-GN-1C  | 3                      | 43.2             | 46.5              | 750             | Gill parasite | 0.930                         |
| REF3-20-AC-28 | REF3-GN-1C  | 2                      | 33.7             | 36.3              | 260             | -             | 0.679                         |
| REF3-20-AC-29 | REF3-GN-1C  | 2                      | 30.5             | 33.0              | 225             | -             | 0.793                         |
| REF3-20-AC-30 | REF3-GN-3C  | 1½                     | 20.3             | 22.0              | 64              | -             | 0.765                         |
| REF3-20-AC-31 | REF3-GN-5C  | 2                      | 34.5             | 39.4              | 250             | -             | 0.609                         |
| REF3-20-AC-32 | REF3-GN-5C  | 1½                     | 28.9             | 30.4              | 185             | -             | 0.766                         |
| REF3-20-AC-33 | REF3-GN-6C  | 1½                     | 45.4             | 48.5              | 815             | -             | 0.871                         |
| REF3-20-AC-34 | REF3-GN-6C  | 2                      | 28.3             | 31.4              | 182             | -             | 0.803                         |
| REF3-20-AC-35 | REF3-GN-6C  | 2                      | 28.4             | 30.7              | 162             | Mortality     | 0.707                         |
| REF3-20-AC-36 | REF3-GN-1D  | 3                      | 53.5             | 57.5              | 1,510           | -             | 0.986                         |
| REF3-20-AC-37 | REF3-GN-1D  | 2                      | 31.4             | 34.1              | 258             | -             | 0.833                         |
| REF3-20-AC-38 | REF3-GN-1D  | 2                      | 28.6             | 31.2              | 190             | -             | 0.812                         |
| REF3-20-AC-39 | REF3-GN-1D  | 2                      | 30.6             | 32.9              | 224             | -             | 0.782                         |
| REF3-20-AC-40 | REF3-GN-1D  | 1½                     | 23.4             | 25.9              | 100             | -             | 0.780                         |
| REF3-20-AC-41 | REF3-GN-2D  | 3                      | 48.6             | 51.5              | 855             | -             | 0.745                         |
| REF3-20-AC-42 | REF3-GN-2D  | 2                      | 32.5             | 35.2              | 240             | -             | 0.699                         |
| REF3-20-AC-43 | REF3-GN-2D  | 2                      | 33.6             | 36.1              | 330             | Mortality     | 0.870                         |
| REF3-20-AC-44 | REF3-GN-7A  | 2                      | 35.6             | 38.5              | 350             | -             | 0.776                         |
| REF3-20-AC-45 | REF3-GN-7A  | 1½                     | 52.1             | 55.2              | 1,250           | -             | 0.884                         |
| REF3-20-AC-46 | REF3-GN-12A | 3                      | 54.6             | 58.1              | 1,505           | Mortality     | 0.925                         |
| REF3-20-AC-47 | REF3-GN-7B  | 3                      | 49.6             | 52.7              | 1,225           | -             | 1.004                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.9: Arctic Charr Measurements from Fish Captured at Reference Lake 3 by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID                  | Net ID                    | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities            | Fulton's Condition Factor (K) |
|------------------------------|---------------------------|------------------------|------------------|-------------------|-----------------|--------------------------|-------------------------------|
| REF3-20-AC-48                | REF3-GN-9B                | 2                      | 32.9             | 35.7              | 330             | -                        | 0.927                         |
| REF3-20-AC-49                | REF3-GN-9B                | 3                      | 51.8             | 55.2              | 925             | Mortality                | 0.666                         |
| REF3-20-AC-50                | REF3-GN-9B                | 2                      | 25.9             | 28.0              | 145             | -                        | 0.835                         |
| REF3-20-AC-51                | REF3-GN-9B                | 2                      | 33.6             | 36.2              | 295             | -                        | 0.778                         |
| REF3-20-AC-52                | REF3-GN-9B                | 2                      | 31.7             | 34.2              | 240             | Mortality                | 0.753                         |
| REF3-20-AC-53                | REF3-GN-11B               | 3                      | 55.1             | 58.5              | 1,325           | -                        | 0.792                         |
| REF3-20-AC-54                | REF3-GN-11B               | 2                      | 64.0             | 68.4              | 2,175           | -                        | 0.830                         |
| REF3-20-AC-55                | REF3-GN-11B               | 2                      | 33.1             | 25.6              | 275             | -                        | 0.758                         |
| REF3-20-AC-56                | REF3-GN-11B               | 2                      | 34.4             | 37.1              | 350             | Mortality                | 0.860                         |
| REF3-20-AC-57                | REF3-GN-12B               | 2                      | 30.9             | 33.2              | 280             | -                        | 0.949                         |
| REF3-20-AC-58                | REF3-GN-12B               | 2                      | 26.1             | 28.3              | 140             | Mortality                | 0.787                         |
| REF3-20-AC-59                | REF3-GN-9C                | 2                      | 32.3             | 35.0              | 250             | -                        | 0.742                         |
| REF3-20-AC-60                | REF3-GN-11C               | 2                      | 32.1             | 34.9              | 250             | -                        | 0.756                         |
| REF3-20-AC-61                | REF3-GN-11C               | 2                      | 32.3             | 34.8              | 260             | Caudal fin split at fork | 0.772                         |
| REF3-20-AC-62                | REF3-GN-11C               | 2                      | 29.1             | 31.9              | 185             | -                        | 0.751                         |
| REF3-20-AC-63                | REF3-GN-12C               | 2                      | 26.5             | 28.7              | 160             | -                        | 0.860                         |
| REF3-20-AC-64                | REF3-GN-12C               | 2                      | 24.2             | 26.2              | 115             | -                        | 0.811                         |
| REF3-20-AC-65                | REF3-GN-12C               | 1½                     | 20.6             | 22.4              | 65              | -                        | 0.744                         |
| REF3-20-AC-66                | REF3-GN-7D                | 2                      | 34.5             | 38.7              | 370             | Mortality                | 0.901                         |
| REF3-20-AC-67                | REF3-GN-7D                | 2                      | 30.1             | 32.6              | 238             | -                        | 0.873                         |
| REF3-20-AC-68                | REF3-GN-9D                | 2                      | 29.5             | 31.8              | 210             | -                        | 0.818                         |
| REF3-20-AC-69                | REF3-GN-9D                | 2                      | 31.3             | 33.8              | 230             | -                        | 0.750                         |
| <b>Overall Catch Summary</b> | <b>Sample Size (N)</b>    |                        | <b>69</b>        | <b>69</b>         | <b>69</b>       | -                        | <b>69</b>                     |
|                              | <b>Average</b>            |                        | <b>33.1</b>      | <b>35.6</b>       | <b>380</b>      | -                        | <b>0.799</b>                  |
|                              | <b>Median</b>             |                        | <b>30.9</b>      | <b>33.1</b>       | <b>225</b>      | -                        | <b>0.787</b>                  |
|                              | <b>Standard Deviation</b> |                        | <b>9.3</b>       | <b>9.8</b>        | <b>433</b>      | -                        | <b>0.091</b>                  |
|                              | <b>Standard Error</b>     |                        | <b>1.1</b>       | <b>1.2</b>        | <b>52</b>       | -                        | <b>0.011</b>                  |
|                              | <b>Minimum</b>            |                        | <b>20.3</b>      | <b>22.0</b>       | <b>64</b>       | -                        | <b>0.497</b>                  |
|                              | <b>Maximum</b>            |                        | <b>64.0</b>      | <b>68.4</b>       | <b>2,175</b>    | -                        | <b>1.004</b>                  |

Note: "-" indicates measurement not taken or no comment.

**Table G.10: Gill Netting Catch Records for Camp Lake, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location<br>(NAD83, UTM Zone 17W) |          | Length<br>(m) | Set Date | Lift Date | Set Time | Lift Time | Hours | Effort<br>(m*hrs/100 m) | Arctic Charr Catch<br>Per Mesh Size |           |           | Total Catch | CPUE        |
|-----------------|-----------------------------------|----------|---------------|----------|-----------|----------|-----------|-------|-------------------------|-------------------------------------|-----------|-----------|-------------|-------------|
|                 | Easting                           | Northing |               |          |           |          |           |       |                         | 1½"                                 | 2"        | 3"        |             |             |
| JLO-20-GN-01    | 557514                            | 7914792  | 91.4          | 8-Aug-20 | 8-Aug-20  | 15:30    | 16:30     | 1.00  | 0.914                   | 2                                   | 6         | 5         | 13          | 14.2        |
| JLO-20-GN-02    | 557694                            | 7914771  | 91.4          | 8-Aug-20 | 8-Aug-20  | 15:35    | 17:04     | 1.48  | 1.36                    | 2                                   | 9         | 10        | 21          | 15.5        |
| JLO-20-GN-03    | 557766                            | 7914552  | 91.4          | 8-Aug-20 | 8-Aug-20  | 15:41    | 17:54     | 2.22  | 2.03                    | 3                                   | 16        | 26        | 45          | 22.2        |
| JLO-20-GN-04    | 557656                            | 7914433  | 91.4          | 8-Aug-20 | 8-Aug-20  | 15:45    | 18:00     | 2.25  | 2.06                    | 6                                   | 4         | 5         | 15          | 7.29        |
| <b>Total</b>    |                                   |          |               |          |           |          |           |       | <b>6.35</b>             | <b>13</b>                           | <b>35</b> | <b>46</b> | <b>94</b>   | <b>14.8</b> |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.

**Table G.11: Arctic Charr Measurements from Fish Captured at Camp Lake by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID  | Net ID   | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities             | Fulton's Condition Factor (K) |
|--------------|----------|------------------------|------------------|-------------------|-----------------|---------------------------|-------------------------------|
| JLO-20-AC-01 | JLO-GN-1 | 3                      | 51.2             | 54.7              | 1,230           | -                         | 0.916                         |
| JLO-20-AC-02 | JLO-GN-1 | 3                      | 42.3             | 45.8              | 590             | -                         | 0.780                         |
| JLO-20-AC-03 | JLO-GN-1 | 3                      | 36.7             | 39.4              | 485             | -                         | 0.981                         |
| JLO-20-AC-04 | JLO-GN-1 | 3                      | 38.0             | 43.5              | 540             | -                         | 0.984                         |
| JLO-20-AC-05 | JLO-GN-1 | 3                      | 38.6             | 41.9              | 505             | -                         | 0.878                         |
| JLO-20-AC-06 | JLO-GN-1 | 2                      | 39.4             | 42.6              | 480             | -                         | 0.785                         |
| JLO-20-AC-07 | JLO-GN-1 | 2                      | 40.4             | 43.8              | 590             | -                         | 0.895                         |
| JLO-20-AC-08 | JLO-GN-1 | 2                      | 39.9             | 43.0              | 570             | -                         | 0.897                         |
| JLO-20-AC-09 | JLO-GN-1 | 2                      | 35.5             | 38.5              | 480             | -                         | 1.073                         |
| JLO-20-AC-10 | JLO-GN-1 | 2                      | 40.7             | 43.9              | 630             | -                         | 0.934                         |
| JLO-20-AC-11 | JLO-GN-1 | 2                      | 39.2             | 42.8              | 575             | -                         | 0.955                         |
| JLO-20-AC-12 | JLO-GN-1 | 1½                     | 38.4             | 41.7              | 500             | -                         | 0.883                         |
| JLO-20-AC-13 | JLO-GN-1 | 1½                     | 21.9             | 23.6              | 100             | -                         | 0.952                         |
| JLO-20-AC-14 | JLO-GN-2 | 1½                     | 39.0             | 43.2              | 505             | -                         | 0.851                         |
| JLO-20-AC-15 | JLO-GN-2 | 1½                     | 38.8             | 42.4              | 520             | -                         | 0.890                         |
| JLO-20-AC-16 | JLO-GN-2 | 2                      | 35.0             | 37.7              | 420             | -                         | 0.980                         |
| JLO-20-AC-17 | JLO-GN-2 | 2                      | 39.2             | 42.2              | 550             | -                         | 0.913                         |
| JLO-20-AC-18 | JLO-GN-2 | 2                      | 37.8             | 41.2              | 515             | -                         | 0.954                         |
| JLO-20-AC-19 | JLO-GN-2 | 2                      | 35.6             | 38.2              | 425             | -                         | 0.942                         |
| JLO-20-AC-20 | JLO-GN-2 | 2                      | 37.1             | 40.5              | 475             | -                         | 0.930                         |
| JLO-20-AC-21 | JLO-GN-2 | 2                      | 38.4             | 42.2              | 510             | -                         | 0.901                         |
| JLO-20-AC-22 | JLO-GN-2 | 2                      | 34.5             | 37.5              | 430             | -                         | 1.047                         |
| JLO-20-AC-23 | JLO-GN-2 | 2                      | 41.3             | 45.3              | 645             | -                         | 0.916                         |
| JLO-20-AC-24 | JLO-GN-2 | 2                      | 39.3             | 42.7              | 580             | -                         | 0.956                         |
| JLO-20-AC-25 | JLO-GN-2 | 3                      | 38.3             | 42.2              | 495             | -                         | 0.881                         |
| JLO-20-AC-26 | JLO-GN-2 | 3                      | 38.6             | 41.8              | 605             | -                         | 1.052                         |
| JLO-20-AC-27 | JLO-GN-2 | 3                      | 40.0             | 43.4              | 600             | -                         | 0.938                         |
| JLO-20-AC-28 | JLO-GN-2 | 3                      | 39.9             | 43.3              | 630             | Tagged green<br>NSC103986 | 0.992                         |
| JLO-20-AC-29 | JLO-GN-2 | 3                      | 35.1             | 38.4              | 470             | -                         | 1.087                         |
| JLO-20-AC-30 | JLO-GN-2 | 3                      | 39.5             | 43.1              | 550             | -                         | 0.892                         |
| JLO-20-AC-31 | JLO-GN-2 | 3                      | 39.5             | 43.1              | 585             | -                         | 0.949                         |
| JLO-20-AC-32 | JLO-GN-2 | 3                      | 36.8             | 40.5              | 480             | -                         | 0.963                         |
| JLO-20-AC-33 | JLO-GN-2 | 3                      | 38.0             | 41.4              | 560             | -                         | 1.021                         |
| JLO-20-AC-34 | JLO-GN-2 | 3                      | 39.2             | 42.9              | 550             | -                         | 0.913                         |
| JLO-20-AC-35 | JLO-GN-3 | 1½                     | 34.5             | 37.2              | 415             | -                         | 1.011                         |
| JLO-20-AC-36 | JLO-GN-3 | 1½                     | 26.4             | 28.7              | 192             | -                         | 1.043                         |
| JLO-20-AC-37 | JLO-GN-3 | 1½                     | 38.6             | 42.9              | 600             | -                         | 1.043                         |
| JLO-20-AC-38 | JLO-GN-3 | 2                      | 37.0             | 40.5              | 505             | -                         | 0.997                         |
| JLO-20-AC-39 | JLO-GN-3 | 2                      | 51.8             | 55.0              | 1,160           | -                         | 0.835                         |
| JLO-20-AC-40 | JLO-GN-3 | 2                      | 41.0             | 44.8              | 640             | -                         | 0.929                         |
| JLO-20-AC-41 | JLO-GN-3 | 2                      | 35.4             | 38.6              | 480             | -                         | 1.082                         |
| JLO-20-AC-42 | JLO-GN-3 | 2                      | 36.2             | 39.3              | 425             | -                         | 0.896                         |
| JLO-20-AC-43 | JLO-GN-3 | 2                      | 37.2             | 41.1              | 515             | -                         | 1.000                         |
| JLO-20-AC-44 | JLO-GN-3 | 2                      | 36.2             | 39.3              | 510             | -                         | 1.075                         |
| JLO-20-AC-45 | JLO-GN-3 | 2                      | 36.8             | 40.2              | 485             | -                         | 0.973                         |
| JLO-20-AC-46 | JLO-GN-3 | 2                      | 35.9             | 38.7              | 445             | -                         | 0.962                         |
| JLO-20-AC-47 | JLO-GN-3 | 2                      | 37.5             | 40.6              | 490             | -                         | 0.929                         |
| JLO-20-AC-48 | JLO-GN-3 | 2                      | 35.6             | 38.9              | 480             | -                         | 1.064                         |
| JLO-20-AC-49 | JLO-GN-3 | 2                      | 36.8             | 40.0              | 465             | -                         | 0.933                         |
| JLO-20-AC-50 | JLO-GN-3 | 2                      | 36.0             | 39.3              | 480             | -                         | 1.029                         |
| JLO-20-AC-51 | JLO-GN-3 | 2                      | 37.5             | 40.4              | 485             | -                         | 0.920                         |
| JLO-20-AC-52 | JLO-GN-3 | 2                      | 37.0             | 40.3              | 465             | -                         | 0.918                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.11: Arctic Charr Measurements from Fish Captured at Camp Lake by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID           | Net ID             | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities | Fulton's Condition Factor (K) |
|-----------------------|--------------------|------------------------|------------------|-------------------|-----------------|---------------|-------------------------------|
| JLO-20-AC-53          | JLO-GN-3           | 2                      | 36.5             | 40.1              | 455             | -             | 0.936                         |
| JLO-20-AC-54          | JLO-GN-3           | 3                      | 42.5             | 46.2              | 680             | -             | 0.886                         |
| JLO-20-AC-55          | JLO-GN-3           | 3                      | 40.8             | 44.3              | 700             | -             | 1.031                         |
| JLO-20-AC-56          | JLO-GN-3           | 3                      | 38.2             | 41.7              | 515             | -             | 0.924                         |
| JLO-20-AC-57          | JLO-GN-3           | 3                      | 37.0             | 39.8              | 460             | -             | 0.908                         |
| JLO-20-AC-58          | JLO-GN-3           | 3                      | 38.7             | 42.4              | 545             | -             | 0.940                         |
| JLO-20-AC-59          | JLO-GN-3           | 3                      | 37.3             | 40.4              | 510             | -             | 0.983                         |
| JLO-20-AC-60          | JLO-GN-3           | 3                      | 34.0             | 37.1              | 420             | -             | 1.069                         |
| JLO-20-AC-61          | JLO-GN-3           | 3                      | 39.2             | 42.6              | 610             | -             | 1.013                         |
| JLO-20-AC-62          | JLO-GN-3           | 3                      | 39.5             | 42.6              | 540             | -             | 0.876                         |
| JLO-20-AC-63          | JLO-GN-3           | 3                      | 38.7             | 42.8              | 525             | -             | 0.906                         |
| JLO-20-AC-64          | JLO-GN-3           | 3                      | 52.0             | 59.6              | 1,040           | -             | 0.740                         |
| JLO-20-AC-65          | JLO-GN-3           | 3                      | 38.5             | 42.0              | 545             | -             | 0.955                         |
| JLO-20-AC-66          | JLO-GN-3           | 3                      | 39.2             | 43.0              | 530             | -             | 0.880                         |
| JLO-20-AC-67          | JLO-GN-3           | 3                      | 36.6             | 40.0              | 460             | -             | 0.938                         |
| JLO-20-AC-68          | JLO-GN-3           | 3                      | 38.2             | 41.4              | 565             | -             | 1.014                         |
| JLO-20-AC-69          | JLO-GN-3           | 3                      | 36.1             | 39.2              | 455             | -             | 0.967                         |
| JLO-20-AC-70          | JLO-GN-3           | 3                      | 35.8             | 38.9              | 450             | Jaw broken    | 0.981                         |
| JLO-20-AC-71          | JLO-GN-3           | 3                      | 37.6             | 40.7              | 495             | -             | 0.931                         |
| JLO-20-AC-72          | JLO-GN-3           | 3                      | 38.9             | 42.6              | 590             | -             | 1.002                         |
| JLO-20-AC-73          | JLO-GN-3           | 3                      | 34.9             | 37.9              | 450             | -             | 1.059                         |
| JLO-20-AC-74          | JLO-GN-3           | 3                      | 40.2             | 43.5              | 560             | -             | 0.862                         |
| JLO-20-AC-75          | JLO-GN-3           | 3                      | 48.9             | 53.2              | 1,080           | -             | 0.924                         |
| JLO-20-AC-76          | JLO-GN-3           | 3                      | 39.0             | 42.3              | 530             | -             | 0.893                         |
| JLO-20-AC-77          | JLO-GN-3           | 3                      | 36.4             | 39.6              | 505             | -             | 1.047                         |
| JLO-20-AC-78          | JLO-GN-3           | 3                      | 39.7             | 43.4              | 595             | -             | 0.951                         |
| JLO-20-AC-79          | JLO-GN-3           | 3                      | 39.0             | 42.5              | 550             | -             | 0.927                         |
| JLO-20-AC-80          | JLO-GN-4           | 3                      | 38.6             | 43.5              | 490             | -             | 0.852                         |
| JLO-20-AC-81          | JLO-GN-4           | 3                      | 53.3             | 57.3              | 1,530           | -             | 1.010                         |
| JLO-20-AC-82          | JLO-GN-4           | 3                      | 38.0             | 40.9              | 505             | -             | 0.920                         |
| JLO-20-AC-83          | JLO-GN-4           | 3                      | 42.0             | 45.0              | 660             | -             | 0.891                         |
| JLO-20-AC-84          | JLO-GN-4           | 3                      | 40.0             | 43.1              | 610             | -             | 0.953                         |
| JLO-20-AC-85          | JLO-GN-4           | 2                      | 37.7             | 40.9              | 520             | -             | 0.970                         |
| JLO-20-AC-86          | JLO-GN-4           | 2                      | 35.1             | 38.0              | 420             | -             | 0.971                         |
| JLO-20-AC-87          | JLO-GN-4           | 2                      | 38.8             | 43.3              | 625             | -             | 1.070                         |
| JLO-20-AC-88          | JLO-GN-4           | 1½                     | 41.5             | 45.3              | 665             | -             | 0.930                         |
| JLO-20-AC-89          | JLO-GN-4           | 2                      | 36.5             | 39.7              | 490             | -             | 1.008                         |
| JLO-20-AC-90          | JLO-GN-4           | 1½                     | 24.1             | 26.3              | 130             | -             | 0.929                         |
| JLO-20-AC-91          | JLO-GN-4           | 1½                     | 38.4             | 42.6              | 500             | -             | 0.883                         |
| JLO-20-AC-92          | JLO-GN-4           | 1½                     | 41.4             | 44.5              | 680             | -             | 0.958                         |
| JLO-20-AC-93          | JLO-GN-4           | 1½                     | 38.5             | 42.4              | 550             | -             | 0.964                         |
| JLO-20-AC-94          | JLO-GN-4           | 1½                     | 35.7             | 38.6              | 440             | -             | 0.967                         |
| Overall Catch Summary | Sample Size (N)    |                        | 94               | 94                | 94              | -             | 94                            |
|                       | Average            |                        | 38.3             | 41.8              | 551             | -             | 0.950                         |
|                       | Median             |                        | 38.4             | 42.0              | 515             | -             | 0.946                         |
|                       | Standard Deviation |                        | 4.4              | 4.8               | 188             | -             | 0.068                         |
|                       | Standard Error     |                        | 0.45             | 0.50              | 19              | -             | 0.007                         |
|                       | Minimum            |                        | 21.9             | 23.6              | 100             | -             | 0.740                         |
|                       | Maximum            |                        | 53.3             | 59.6              | 1,530           | -             | 1.087                         |

Note: "-" indicates measurement not taken or no comment.



**Table G.12: Results of Littoral/Profundal Arctic Charr Health Endpoint Statistical Comparisons between 2020 Camp Lake (JLO) and 2020 Reference Lake 3 (REF) Data, and for Camp Lake between 2020 and the Mine Baseline Period (2005 to 2013), Mary River Project 2020 CREMP**

| Comparison                              | Indicator             | Endpoint                      | Variables            |                       | Sample Size          |          | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |                      |          | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|-----------------------------------------|-----------------------|-------------------------------|----------------------|-----------------------|----------------------|----------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|----------------------|----------|--------------|--------------------------------------------|
|                                         |                       |                               | Response             | Covariate             | REF 2020 or JLO Base | JLO 2020 |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |                      |          |              |                                            |
|                                         |                       |                               |                      |                       |                      |          |        | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF 2020 or JLO Base | JLO 2020 |              |                                            |
| Camp Lake versus Reference Lake 3, 2020 | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 69                   | 94       | K-S    | -                       | -                    | -                                            | -                               | -                    | -        | <0.001       | -                                          |
|                                         | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 69                   | 94       | M-W    | -                       | -                    | -                                            | Median                          | 30.9                 | 38.4     | <0.001       | 24                                         |
|                                         |                       | Body Weight                   | Body Weight (g)      | -                     | 69                   | 94       | M-W    | -                       | -                    | -                                            | Median                          | 225                  | 515      | <0.001       | 129                                        |
|                                         | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 69                   | 94       | ANCOVA | <0.001 <sup>e</sup>     | <0.001               | 35.4                                         | Adjusted Mean                   | 352                  | 420      | <0.001       | 19                                         |
|                                         |                       | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 68 <sup>f</sup>      | 94       | ANCOVA | <0.001 <sup>g</sup>     | <0.001               | 35.4                                         | Adjusted Mean                   | 356                  | 422      | <0.001       | 18                                         |
| Camp Lake 2020 versus Baseline          | Survival              | Length Frequency Distribution | Fork Length (cm)     | -                     | 131                  | 94       | K-S    | -                       | -                    | -                                            | -                               | -                    | -        | <0.001       | -                                          |
|                                         | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 131                  | 94       | M-W    | -                       | -                    | -                                            | Median                          | 32.3                 | 38.4     | <0.001       | 19                                         |
|                                         |                       | Body Weight                   | Body Weight (g)      | -                     | 131                  | 94       | M-W    | -                       | -                    | -                                            | Median                          | 350                  | 515      | <0.001       | 47                                         |
|                                         | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 131                  | 94       | ANCOVA | 0.163                   | <0.001               | 33.6                                         | Adjusted Mean                   | 364                  | 361      | 0.725        | -                                          |

 Area P-value < 0.1 or Interaction P-value < 0.05

 Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

<sup>e</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9806 and R2 of parallel slope model = 0.9792; a difference < 0.02) following Environment Canada (2012).

<sup>f</sup> One outlier (REF3-20-AC-03 Stdnt resid: -5.42) was removed from the analysis.

<sup>g</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9834 and R2 of parallel slope model = 0.982; a difference < 0.02) following Environment Canada (2012).

**Table G.13: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| DLO1-20-ACJ-01 | 4.6              | 4.8               | 0.846           | -           | 0.869                         |
| DLO1-20-ACJ-02 | 8.7              | 9.4               | 6.086           | -           | 0.924                         |
| DLO1-20-ACJ-03 | 3.6              | 3.9               | 0.378           | -           | 0.810                         |
| DLO1-20-ACJ-04 | 9.3              | 10.1              | 6.937           | -           | 0.862                         |
| DLO1-20-ACJ-05 | 3.6              | 3.8               | 0.404           | -           | 0.866                         |
| DLO1-20-ACJ-06 | 8.0              | 8.6               | 5.002           | -           | 0.977                         |
| DLO1-20-ACJ-07 | 11.7             | 12.6              | 15.090          | -           | 0.942                         |
| DLO1-20-ACJ-08 | 10.4             | 11.2              | 9.541           | -           | 0.848                         |
| DLO1-20-ACJ-09 | 7.5              | 7.9               | 4.201           | -           | 0.996                         |
| DLO1-20-ACJ-10 | 3.4              | 3.6               | 0.355           | -           | 0.903                         |
| DLO1-20-ACJ-11 | 8.7              | 9.3               | 5.961           | -           | 0.905                         |
| DLO1-20-ACJ-12 | 7.8              | 8.3               | 3.871           | -           | 0.816                         |
| DLO1-20-ACJ-13 | 7.7              | 8.2               | 4.450           | -           | 0.975                         |
| DLO1-20-ACJ-14 | 4.5              | 4.7               | 0.872           | -           | 0.957                         |
| DLO1-20-ACJ-15 | 11.6             | 12.5              | 12.792          | -           | 0.820                         |
| DLO1-20-ACJ-16 | 3.5              | 3.6               | 0.351           | -           | 0.819                         |
| DLO1-20-ACJ-17 | 8.7              | 9.3               | 6.246           | -           | 0.949                         |
| DLO1-20-ACJ-18 | 3.5              | 3.6               | 0.380           | -           | 0.886                         |
| DLO1-20-ACJ-19 | 7.9              | 8.5               | 4.402           | -           | 0.893                         |
| DLO1-20-ACJ-20 | 11.4             | 12.3              | 13.568          | -           | 0.916                         |
| DLO1-20-ACJ-21 | 7.9              | 8.4               | 4.313           | -           | 0.875                         |
| DLO1-20-ACJ-22 | 8.8              | 9.3               | 6.146           | -           | 0.902                         |
| DLO1-20-ACJ-23 | 8.1              | 8.6               | 4.077           | -           | 0.767                         |
| DLO1-20-ACJ-24 | 9.7              | 10.4              | 7.574           | -           | 0.830                         |
| DLO1-20-ACJ-25 | 9.9              | 10.7              | 8.083           | -           | 0.833                         |
| DLO1-20-ACJ-26 | 7.2              | 7.6               | 4.003           | -           | 1.072                         |
| DLO1-20-ACJ-27 | 6.2              | 6.6               | 2.580           | -           | 1.083                         |
| DLO1-20-ACJ-28 | 9.4              | 10.0              | 6.832           | -           | 0.823                         |
| DLO1-20-ACJ-29 | 9.3              | 9.9               | 8.018           | -           | 0.997                         |
| DLO1-20-ACJ-30 | 3.9              | 4.1               | 0.570           | -           | 0.961                         |
| DLO1-20-ACJ-31 | 4.1              | 4.3               | 0.659           | -           | 0.956                         |
| DLO1-20-ACJ-32 | 9.5              | 10.1              | 7.012           | -           | 0.818                         |
| DLO1-20-ACJ-33 | 9.0              | 9.7               | 7.049           | -           | 0.967                         |
| DLO1-20-ACJ-34 | 7.8              | 8.4               | 4.345           | -           | 0.916                         |
| DLO1-20-ACJ-35 | 8.9              | 9.7               | 7.711           | -           | 1.094                         |
| DLO1-20-ACJ-36 | 11.2             | 12.0              | 13.525          | -           | 0.963                         |
| DLO1-20-ACJ-37 | 10.5             | 11.2              | 9.821           | -           | 0.848                         |
| DLO1-20-ACJ-38 | 3.4              | 3.5               | 0.297           | -           | 0.756                         |
| DLO1-20-ACJ-39 | 3.9              | 4.1               | 0.527           | -           | 0.888                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.13: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| DLO1-20-ACJ-40 | 11.3             | 12.1              | 13.146          | -           | 0.911                         |
| DLO1-20-ACJ-41 | 7.5              | 8.2               | 3.661           | -           | 0.868                         |
| DLO1-20-ACJ-42 | 8.3              | 8.8               | 5.322           | -           | 0.931                         |
| DLO1-20-ACJ-43 | 4.8              | 5.0               | 1.181           | -           | 1.068                         |
| DLO1-20-ACJ-44 | 6.5              | 6.8               | 2.470           | -           | 0.899                         |
| DLO1-20-ACJ-45 | 4.6              | 4.8               | 0.862           | -           | 0.886                         |
| DLO1-20-ACJ-46 | 7.9              | 8.5               | 4.548           | -           | 0.922                         |
| DLO1-20-ACJ-47 | 9.0              | 9.7               | 6.408           | -           | 0.879                         |
| DLO1-20-ACJ-48 | 9.4              | 10.0              | 6.905           | -           | 0.831                         |
| DLO1-20-ACJ-49 | 10.5             | 11.2              | 9.789           | -           | 0.846                         |
| DLO1-20-ACJ-50 | 8.2              | 8.7               | 5.365           | -           | 0.973                         |
| DLO1-20-ACJ-51 | 7.9              | 8.4               | 4.912           | 1           | 0.996                         |
| DLO1-20-ACJ-52 | 7.3              | 7.9               | 3.852           | 1           | 0.990                         |
| DLO1-20-ACJ-53 | 7.0              | 7.4               | 2.932           | 1           | 0.855                         |
| DLO1-20-ACJ-54 | 9.9              | 10.7              | 7.688           | 2           | 0.792                         |
| DLO1-20-ACJ-55 | 10.2             | 11.2              | 10.960          | 2           | 1.033                         |
| DLO1-20-ACJ-56 | 12.9             | 14.0              | 18.496          | 4           | 0.862                         |
| DLO1-20-ACJ-57 | 11.5             | 12.3              | 13.339          | 4           | 0.877                         |
| DLO1-20-ACJ-58 | 11.7             | 12.6              | 14.005          | 3           | 0.874                         |
| DLO1-20-ACJ-59 | 15.5             | 16.7              | 35.893          | 4           | 0.964                         |
| DLO1-20-ACJ-60 | 18.1             | 19.5              | 48.450          | 7           | 0.817                         |
| DLO1-20-ACJ-61 | 9.7              | 10.3              | 7.779           | -           | 0.852                         |
| DLO1-20-ACJ-62 | 7.7              | 8.2               | 4.041           | -           | 0.885                         |
| DLO1-20-ACJ-63 | 7.0              | 7.5               | 3.726           | -           | 1.086                         |
| DLO1-20-ACJ-64 | 7.9              | 8.4               | 4.725           | -           | 0.958                         |
| DLO1-20-ACJ-65 | 9.7              | 10.4              | 8.076           | -           | 0.885                         |
| DLO1-20-ACJ-66 | 10.6             | 11.4              | 9.587           | -           | 0.805                         |
| DLO1-20-ACJ-67 | 14.0             | 15.3              | 28.142          | -           | 1.026                         |
| DLO1-20-ACJ-68 | 16.5             | 17.7              | 38.846          | -           | 0.865                         |
| DLO1-20-ACJ-69 | 9.9              | 10.6              | 7.934           | -           | 0.818                         |
| DLO1-20-ACJ-70 | 11.2             | 12.1              | 11.861          | -           | 0.844                         |
| DLO1-20-ACJ-71 | 2.7              | 2.8               | 0.146           | -           | 0.742                         |
| DLO1-20-ACJ-72 | 7.2              | 7.7               | 3.448           | -           | 0.924                         |
| DLO1-20-ACJ-73 | 7.7              | 8.2               | 4.062           | -           | 0.890                         |
| DLO1-20-ACJ-74 | 16.7             | 18.0              | 40.241          | -           | 0.864                         |
| DLO1-20-ACJ-75 | 10.1             | 10.9              | 8.970           | -           | 0.871                         |
| DLO1-20-ACJ-76 | 8.1              | 8.6               | 4.241           | -           | 0.798                         |
| DLO1-20-ACJ-77 | 12.8             | 13.8              | 17.240          | -           | 0.822                         |
| DLO1-20-ACJ-78 | 9.8              | 10.5              | 9.389           | -           | 0.998                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.13: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID                     |                    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------------------------|--------------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| DLO1-20-ACJ-79                  |                    | 9.7              | 10.5              | 8.959           | -           | 0.982                         |
| DLO1-20-ACJ-80                  |                    | 4.0              | 4.2               | 0.570           | -           | 0.891                         |
| DLO1-20-ACJ-81                  |                    | 7.3              | 7.8               | 3.598           | -           | 0.925                         |
| DLO1-20-ACJ-82                  |                    | 7.8              | 8.3               | 4.148           | -           | 0.874                         |
| DLO1-20-ACJ-83                  |                    | 14.9             | 16.3              | 27.709          | -           | 0.838                         |
| DLO1-20-ACJ-84                  |                    | 7.8              | 8.3               | 3.976           | -           | 0.838                         |
| DLO1-20-ACJ-85                  |                    | 8.7              | 9.3               | 5.436           | -           | 0.826                         |
| DLO1-20-ACJ-86                  |                    | 9.8              | 10.4              | 9.015           | -           | 0.958                         |
| DLO1-20-ACJ-87                  |                    | 15.8             | 17.2              | 35.652          | -           | 0.904                         |
| DLO1-20-ACJ-88                  |                    | 9.4              | 10.1              | 7.207           | -           | 0.868                         |
| DLO1-20-ACJ-89                  |                    | 12.5             | 13.6              | 21.609          | -           | 1.106                         |
| DLO1-20-ACJ-90                  |                    | 7.8              | 8.3               | 4.004           | -           | 0.844                         |
| DLO1-20-ACJ-91                  |                    | 17.9             | 19.6              | 54.993          | -           | 0.959                         |
| DLO1-20-ACJ-92                  |                    | 7.2              | 7.6               | 3.313           | -           | 0.888                         |
| DLO1-20-ACJ-93                  |                    | 6.3              | 6.7               | 2.087           | -           | 0.835                         |
| DLO1-20-ACJ-94                  |                    | 10.5             | 11.5              | 12.259          | -           | 1.059                         |
| DLO1-20-ACJ-95                  |                    | 9.0              | 9.6               | 6.038           | -           | 0.828                         |
| DLO1-20-ACJ-96                  |                    | 9.8              | 10.6              | 8.714           | -           | 0.926                         |
| DLO1-20-ACJ-97                  |                    | 11.1             | 12.0              | 11.346          | -           | 0.830                         |
| DLO1-20-ACJ-98                  |                    | 8.6              | 9.3               | 5.571           | -           | 0.876                         |
| DLO1-20-ACJ-99                  |                    | 10.3             | 11.1              | 9.832           | -           | 0.900                         |
| DLO1-20-ACJ-100                 |                    | 9.7              | 10.3              | 7.492           | -           | 0.821                         |
| Overall Catch Summary           | Sample Size (N)    | 100              | 100               | 100             | 10          | 100                           |
|                                 | Average            | 8.9              | 10                | 8.910           | 2.9         | 0.901                         |
|                                 | Median             | 8.8              | 9.4               | 6.116           | 2.5         | 0.886                         |
|                                 | Standard Deviation | 3.2              | 3.5               | 10.121          | 1.9         | 0.079                         |
|                                 | Standard Error     | 0.32             | 0.35              | 1.012           | 0.6         | 0.008                         |
|                                 | Minimum            | 2.7              | 2.8               | 0.146           | 1.0         | 0.742                         |
|                                 | Maximum            | 18.1             | 19.6              | 54.993          | 7.0         | 1.106                         |
| Young-of-the-Year Catch Summary | proportion of YOY  | 15%              |                   |                 |             |                               |
|                                 | Sample Size (N)    | 15               | 15                | 15              | 0           | 15                            |
|                                 | Average            | 3.9              | 4.1               | 0.6             | -           | 0.9                           |
|                                 | Median             | 3.9              | 4.1               | 0.5             | -           | 0.9                           |
|                                 | Standard Deviation | 0.6              | 0.6               | 0.3             | -           | 0.1                           |
|                                 | Standard Error     | 0.1              | 0.2               | 0.1             | -           | 0.0                           |
|                                 | Minimum            | 2.7              | 2.8               | 0.1             | 0.0         | 0.7                           |
|                                 | Maximum            | 4.8              | 5.0               | 1.2             | 0.0         | 1.1                           |

Note: "-" indicates measurement not taken or no comment.

**Table G.14: Results of Nearshore Arctic Charr Non-Young-of-the-Year (YOY) Health Endpoint Statistical Comparisons between Sheardown Lake NW (DLO1) and Reference Lake 3 (REF), Mary River Project CREMP, August 2020**

| Group    | Indicator                | Endpoint                      | Variables            |                       | Sample Size     |      | Test     | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |       |       | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|----------|--------------------------|-------------------------------|----------------------|-----------------------|-----------------|------|----------|-------------------------|----------------------|----------------------------------------------|---------------------------------|-------|-------|--------------|--------------------------------------------|
|          |                          |                               | Response             | Covariate             | REF             | DLO1 |          | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |       |       |              |                                            |
|          |                          |                               |                      |                       |                 |      |          | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF   | DLO1  |              |                                            |
| All Fish | Recruitment/<br>Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 100             | 100  | K-S      | -                       | -                    | -                                            | -                               | -     | -     | <0.001       | -                                          |
| YOY      | Body Size                | Fork Length                   | Fork Length (cm)     | -                     | 21              | 15   | tunequal | -                       | -                    | -                                            | Mean                            | 3.60  | 3.87  | 0.119        | -                                          |
|          |                          | Body Weight                   | Body Weight (g)      | -                     | 21              | 15   | tunequal | -                       | -                    | -                                            | Mean                            | 0.388 | 0.560 | 0.038        | 44                                         |
|          | Energy Storage           | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 21              | 15   | ANCOVA   | 0.534                   | <0.001               | 3.69                                         | Adjusted Mean                   | 0.406 | 0.435 | 0.030        | 7.2                                        |
|          |                          |                               |                      |                       | 20 <sup>e</sup> | 15   | ANCOVA   | 0.217                   | <0.001               | 3.69                                         | Adjusted Mean                   | 0.399 | 0.435 | 0.002        | 9.0                                        |
| Non-YOY  | Survival                 | Length Frequency Distribution | Fork Length (cm)     | -                     | 79              | 85   | K-S      | -                       | -                    | -                                            | -                               | -     | -     | <0.001       | -                                          |
|          | Body Size                | Fork Length                   | Fork Length (cm)     | -                     | 79              | 85   | M-W      | -                       | -                    | -                                            | Median                          | 7.70  | 9.40  | <0.001       | 22                                         |
|          |                          | Body Weight                   | Body Weight (g)      | -                     | 79              | 85   | M-W      | -                       | -                    | -                                            | Median                          | 3.55  | 7.05  | <0.001       | 99                                         |
|          | Energy Storage           | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 79              | 85   | ANCOVA   | 0.400                   | <0.001               | 8.62                                         | Adjusted Mean                   | 5.27  | 5.78  | <0.001       | 9.7                                        |

Area P-value < 0.1 or Interaction P-value < 0.05.

Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint).

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

<sup>e</sup> One outlier (REF3-20-ACJ-55, Stdnt resid: 4.179) removed from analysis.

**Table G.15: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Sheardown Lake NW (DLO1) Using 2020 Data Relative to Reference Lake 3 Data (2020) or Sheardown Lake NW Baseline Data (2006 to 2013) with  $\alpha=\beta=0.1$ , Mary River Project 2020 CREMP**

| Comparison                                                                   | Group    | Indicator      | Endpoint               | Variables                     |                       | Test <sup>a</sup> | S <sup>b</sup> | COV (%) <sup>c</sup> | Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1 |          |       |      |      |      |      |      |      |      |       |
|------------------------------------------------------------------------------|----------|----------------|------------------------|-------------------------------|-----------------------|-------------------|----------------|----------------------|-------------------------------------------------------------------------------------------------------|----------|-------|------|------|------|------|------|------|------|-------|
|                                                                              |          |                |                        | Response                      | Covariate             |                   |                |                      | log(Response)                                                                                         | 5%       | 10%   | 20%  | 25%  | 30%  | 33%  | 40%  | 50%  | 100% |       |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | -5%      | -9%   | -17% | -20% | -23% | -25% | -29% | -33% | -50% |       |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | Response | ±5%   | ±10% | ±20% | ±25% | ±30% | ±33% | ±40% | ±50% | ±100% |
| Nearshore Arctic Charr (Electrofishing) versus Ref. Lake 3, 2020 Data        | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.101          | 29.5                 | Response                                                                                              | 452      | 120   | 34   | 24   | 18   | 14   | 11   | 9    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.302          | 167                  | Response                                                                                              | 4,035    | 1,058 | 291  | 195  | 142  | 117  | 86   | 61   | 21   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0343         | -                    | log(Response)                                                                                         | 47       | 14    | 6    | 5    | 4    | 4    | 4    | 3    | 3    |       |
| Nearshore Arctic Charr (Electrofishing) 2020 versus Baseline                 | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.164          | 40.2                 | Response                                                                                              | 1,185    | 312   | 82   | 54   | 38   | 31   | 22   | 14   | 5    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.487          | 118                  | Response                                                                                              | 10,483   | 2,748 | 690  | 443  | 307  | 249  | 174  | 112  | 29   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0675         | -                    | log(Response)                                                                                         | 176      | 48    | 15   | 11   | 8    | 7    | 6    | 5    | 4    |       |
| Littoral/Profundal Arctic Charr (Gill Netting) versus Ref. Lake 3, 2020 Data | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.105          | 28.6                 | Response                                                                                              | 489      | 129   | 36   | 25   | 19   | 16   | 12   | 9    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.319          | 126                  | Response                                                                                              | 4,497    | 1,180 | 323  | 217  | 158  | 131  | 97   | 66   | 24   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.046          | -                    | log(Response)                                                                                         | 83       | 23    | 8    | 6    | 5    | 5    | 4    | 4    | 3    |       |
|                                                                              |          |                | Condition <sup>d</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0416         | -                    | log(Response)                                                                                         | 68       | 20    | 7    | 6    | 5    | 4    | 4    | 4    | 3    |       |
| Littoral/Profundal Arctic Charr (Gill Netting) 2020 versus Baseline          | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.105          | 25.0                 | Response                                                                                              | 484      | 125   | 33   | 21   | 16   | 13   | 10   | 7    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.312          | 88.6                 | Response                                                                                              | 4,286    | 1,124 | 308  | 207  | 150  | 125  | 92   | 64   | 18   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0537         | -                    | log(Response)                                                                                         | 112      | 31    | 10   | 8    | 6    | 6    | 5    | 4    | 3    |       |

<sup>a</sup> Sample size estimates for the M-W test were estimated based for a two-sample t-test using sample sizes multiplied by 0.864. The 0.864 is the lower bound of the asymptotic relative efficiency of the Mann-Whitney test and the two-sample t-test (Hodges and Lehmann 1956). Estimates were generated for the response variable on the untransformed and log<sub>10</sub>-transformed scales and the lowest sample size is reported.

<sup>b</sup> Pooled standard deviation of the regression residuals

<sup>c</sup> Coefficient of variation (pooled standard deviation/reference mean)×100%

<sup>d</sup> Two outliers (DLO1-20-AC-67 Stdnt resid: 4.045 and REF3-20-AC-03 Stdnt resid: -4.707) were removed from the analysis.

**Table G.16: Gill Netting Catch Records for Sheardown Lake NW, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location (NAD83, UTM Zone 17W) |          | Length (m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort (m*hrs/100 m) | Arctic Charr Catch Per Mesh Size |           |           | Total Catch | CPUE        |
|-----------------|--------------------------------|----------|------------|-----------|-----------|----------|-----------|---------------|----------------------|----------------------------------|-----------|-----------|-------------|-------------|
|                 | Easting                        | Northing |            |           |           |          |           |               |                      | 1½"                              | 2"        | 3"        |             |             |
| DLO1-20-GN-1A   | 559838                         | 791360   | 91.4       | 9-Aug-20  | 9-Aug-20  | 12:17    | 13:35     | 1.30          | 1.19                 | 0                                | 2         | 0         | 2           | 1.68        |
| DLO1-20-GN-1B   | 559838                         | 791360   | 91.4       | 9-Aug-20  | 9-Aug-20  | 13:50    | 15:05     | 1.25          | 1.14                 | 2                                | 0         | 1         | 3           | 2.63        |
| DLO1-20-GN-2A   | 559731                         | 7913629  | 91.4       | 9-Aug-20  | 9-Aug-20  | 12:21    | 13:52     | 1.52          | 1.39                 | 2                                | 6         | 2         | 10          | 7.21        |
| DLO1-20-GN-2B   | 559731                         | 7913629  | 91.4       | 9-Aug-20  | 9-Aug-20  | 14:20    | 15:23     | 1.05          | 0.960                | 0                                | 3         | 2         | 5           | 5.21        |
| DLO1-20-GN-2C   | 559731                         | 7913629  | 91.4       | 9-Aug-20  | 9-Aug-20  | 15:50    | 17:23     | 1.55          | 1.42                 | 0                                | 4         | 0         | 4           | 2.82        |
| DLO1-20-GN-3A   | 559686                         | 7913536  | 91.4       | 9-Aug-20  | 9-Aug-20  | 12:25    | 14:22     | 1.95          | 1.78                 | 0                                | 5         | 4         | 9           | 5.05        |
| DLO1-20-GN-3B   | 559686                         | 7913536  | 91.4       | 9-Aug-20  | 9-Aug-20  | 14:47    | 16:33     | 1.77          | 1.61                 | 2                                | 2         | 2         | 6           | 3.72        |
| DLO1-20-GN-4    | 559794                         | 7913269  | 91.4       | 9-Aug-20  | 9-Aug-20  | 12:36    | 14:50     | 2.23          | 2.04                 | 0                                | 2         | 0         | 2           | 0.980       |
| DLO1-20-GN-5    | 559686                         | 7913374  | 91.4       | 9-Aug-20  | 9-Aug-20  | 15:00    | 16:54     | 1.90          | 1.74                 | 1                                | 2         | 0         | 3           | 1.73        |
| DLO1-20-GN-6    | 559735                         | 7913671  | 91.4       | 9-Aug-20  | 9-Aug-20  | 15:21    | 17:08     | 1.78          | 1.63                 | 0                                | 5         | 1         | 6           | 3.68        |
| DLO1-20-GN-7A   | 559830                         | 7913679  | 91.4       | 11-Aug-20 | 11-Aug-20 | 9:28     | 10:33     | 1.08          | 0.991                | 1                                | 2         | 0         | 3           | 3.03        |
| DLO1-20-GN-7B   | 559830                         | 7913679  | 91.4       | 11-Aug-20 | 11-Aug-20 | 10:46    | 12:26     | 1.67          | 1.52                 | 2                                | 0         | 0         | 2           | 1.31        |
| DLO1-20-GN-8A   | 559776                         | 7913622  | 91.4       | 11-Aug-20 | 11-Aug-20 | 9:37     | 10:49     | 1.20          | 1.10                 | 2                                | 5         | 6         | 13          | 11.9        |
| DLO1-20-GN-8B   | 559776                         | 7913622  | 91.4       | 11-Aug-20 | 11-Aug-20 | 11:40    | 12:57     | 1.28          | 1.17                 | 1                                | 1         | 1         | 3           | 2.56        |
| DLO1-20-GN-8C   | 559776                         | 7913622  | 91.4       | 11-Aug-20 | 11-Aug-20 | 13:10    | 14:38     | 1.47          | 1.34                 | 0                                | 3         | 0         | 3           | 2.24        |
| DLO1-20-GN-8D   | 559776                         | 7913622  | 91.4       | 11-Aug-20 | 11-Aug-20 | 14:50    | 15:38     | 0.80          | 0.731                | 0                                | 1         | 0         | 1           | 1.37        |
| DLO1-20-GN-9A   | 559755                         | 7913540  | 91.4       | 11-Aug-20 | 11-Aug-20 | 9:49     | 11:40     | 1.85          | 1.69                 | 0                                | 3         | 1         | 4           | 2.37        |
| DLO1-20-GN-9B   | 559755                         | 7913540  | 91.4       | 11-Aug-20 | 11-Aug-20 | 11:52    | 13:11     | 1.32          | 1.20                 | 0                                | 2         | 0         | 2           | 1.66        |
| DLO1-20-GN-9C   | 559755                         | 7913540  | 91.4       | 11-Aug-20 | 11-Aug-20 | 13:20    | 14:53     | 1.55          | 1.42                 | 0                                | 2         | 1         | 3           | 2.12        |
| DLO1-20-GN-10A  | 559676                         | 7913367  | 91.4       | 11-Aug-20 | 11-Aug-20 | 9:54     | 11:55     | 2.02          | 1.84                 | 0                                | 3         | 2         | 5           | 2.71        |
| DLO1-20-GN-10B  | 559676                         | 7913367  | 91.4       | 11-Aug-20 | 11-Aug-20 | 12:13    | 13:24     | 1.18          | 1.08                 | 4                                | 0         | 1         | 5           | 4.62        |
| DLO1-20-GN-10C  | 559676                         | 7913367  | 91.4       | 11-Aug-20 | 11-Aug-20 | 13:42    | 15:12     | 1.50          | 1.37                 | 0                                | 3         | 1         | 4           | 2.92        |
| <b>Total</b>    |                                |          |            |           |           |          |           |               | <b>30.4</b>          | <b>17</b>                        | <b>56</b> | <b>25</b> | <b>98</b>   | <b>3.34</b> |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m-hours of net.



**Table G.17: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID   | Net ID     | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities                     | Fulton's Condition Factor (K) |
|---------------|------------|------------------------|------------------|-------------------|-----------------|-----------------------------------|-------------------------------|
| DLO1-20-AC-01 | DLO1-GN-1A | 2                      | 31.3             | 34.2              | 285             | -                                 | 0.929                         |
| DLO1-20-AC-02 | DLO1-GN-1A | 2                      | 31.8             | 34.4              | 285             | Mortality                         | 0.886                         |
| DLO1-20-AC-03 | DLO1-GN-2A | 3                      | 54.3             | 58.5              | 1,280           | -                                 | 0.799                         |
| DLO1-20-AC-04 | DLO1-GN-2A | 3                      | 38.4             | 41.7              | 455             | Very orange                       | 0.804                         |
| DLO1-20-AC-05 | DLO1-GN-2A | 2                      | 51.6             | 55.3              | 1,220           | Gill parasites                    | 0.888                         |
| DLO1-20-AC-06 | DLO1-GN-2A | 2                      | 32.7             | 35.6              | 320             | Mortality - upper caudal deformed | 0.915                         |
| DLO1-20-AC-07 | DLO1-GN-2A | 2                      | 36.1             | 39.0              | 425             | -                                 | 0.903                         |
| DLO1-20-AC-08 | DLO1-GN-2A | 2                      | 33.6             | 36.4              | 380             | Mortality                         | 1.002                         |
| DLO1-20-AC-09 | DLO1-GN-2A | 2                      | 34.5             | 37.4              | 360             | -                                 | 0.877                         |
| DLO1-20-AC-10 | DLO1-GN-2A | 2                      | 56.1             | 60.1              | 1,680           | -                                 | 0.952                         |
| DLO1-20-AC-11 | DLO1-GN-2A | 1½                     | 31.8             | 34.9              | 285             | -                                 | 0.886                         |
| DLO1-20-AC-12 | DLO1-GN-2A | 1½                     | 19.0             | 20.7              | 60              | -                                 | 0.875                         |
| DLO1-20-AC-13 | DLO1-GN-3A | 2                      | 35.6             | 38.4              | 440             | -                                 | 0.975                         |
| DLO1-20-AC-14 | DLO1-GN-3A | 2                      | 49.8             | 53.4              | 980             | -                                 | 0.793                         |
| DLO1-20-AC-15 | DLO1-GN-3A | 2                      | 37.9             | 40.8              | 515             | -                                 | 0.946                         |
| DLO1-20-AC-16 | DLO1-GN-3A | 2                      | 33.5             | 36.4              | 330             | -                                 | 0.878                         |
| DLO1-20-AC-17 | DLO1-GN-3A | 2                      | 51.8             | 55.8              | 1,200           | -                                 | 0.863                         |
| DLO1-20-AC-18 | DLO1-GN-3A | 3                      | 62.0             | 66.4              | 1,560           | -                                 | 0.655                         |
| DLO1-20-AC-19 | DLO1-GN-3A | 3                      | 39.6             | 43.0              | 520             | -                                 | 0.837                         |
| DLO1-20-AC-20 | DLO1-GN-3A | 3                      | 39.5             | 43.2              | 510             | -                                 | 0.828                         |
| DLO1-20-AC-21 | DLO1-GN-3A | 3                      | 36.8             | 40.3              | 460             | -                                 | 0.923                         |
| DLO1-20-AC-22 | DLO1-GN-4  | 2                      | 35.0             | 37.9              | 320             | -                                 | 0.746                         |
| DLO1-20-AC-23 | DLO1-GN-4  | 2                      | 34.2             | 37.1              | 385             | Mortality                         | 0.962                         |
| DLO1-20-AC-24 | DLO1-GN-1B | 3                      | 39.3             | 42.6              | 520             | -                                 | 0.857                         |
| DLO1-20-AC-25 | DLO1-GN-1B | 1½                     | 34.2             | 36.7              | 430             | -                                 | 1.075                         |
| DLO1-20-AC-26 | DLO1-GN-1B | 1½                     | 32.2             | 35.2              | 320             | -                                 | 0.958                         |
| DLO1-20-AC-27 | DLO1-GN-2B | 3                      | 52.9             | 56.3              | 1,080           | -                                 | 0.730                         |
| DLO1-20-AC-28 | DLO1-GN-2B | 2                      | 32.1             | 35.0              | 290             | -                                 | 0.877                         |
| DLO1-20-AC-29 | DLO1-GN-2B | 3                      | 39.8             | 43.0              | 510             | -                                 | 0.809                         |
| DLO1-20-AC-30 | DLO1-GN-2B | 2                      | 36.7             | 39.6              | 435             | -                                 | 0.880                         |
| DLO1-20-AC-31 | DLO1-GN-2B | 2                      | 38.6             | 42.1              | 555             | -                                 | 0.965                         |
| DLO1-20-AC-32 | DLO1-GN-3B | 3                      | 40.2             | 43.4              | 580             | -                                 | 0.893                         |
| DLO1-20-AC-33 | DLO1-GN-3B | 3                      | 34.9             | 37.9              | 390             | -                                 | 0.917                         |
| DLO1-20-AC-34 | DLO1-GN-3B | 2                      | 55.9             | 59.6              | 1,580           | -                                 | 0.905                         |
| DLO1-20-AC-35 | DLO1-GN-3B | 2                      | 34.4             | 37.5              | 390             | Mortality                         | 0.958                         |
| DLO1-20-AC-36 | DLO1-GN-3B | 1½                     | 22.5             | 24.4              | 88              | -                                 | 0.773                         |
| DLO1-20-AC-37 | DLO1-GN-3B | 1½                     | 65.4             | 69.9              | 2,380           | -                                 | 0.851                         |
| DLO1-20-AC-38 | DLO1-GN-5  | 2                      | 35.2             | 38.1              | 345             | Mortality                         | 0.791                         |
| DLO1-20-AC-39 | DLO1-GN-5  | 2                      | 34.9             | 37.6              | 340             | Mortality                         | 0.800                         |
| DLO1-20-AC-40 | DLO1-GN-5  | 1½                     | 35.9             | 38.6              | 410             | -                                 | 0.886                         |
| DLO1-20-AC-41 | DLO1-GN-6  | 3                      | 32.5             | 35.6              | 325             | -                                 | 0.947                         |
| DLO1-20-AC-42 | DLO1-GN-6  | 2                      | 29.5             | 32.3              | 235             | -                                 | 0.915                         |
| DLO1-20-AC-43 | DLO1-GN-6  | 2                      | 39.5             | 42.9              | 545             | -                                 | 0.884                         |

Note: "-" indicates measurement not taken or no comment.



**Table G.17: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID   | Net ID      | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities                      | Fulton's Condition Factor (K) |
|---------------|-------------|------------------------|------------------|-------------------|-----------------|------------------------------------|-------------------------------|
| DLO1-20-AC-44 | DLO1-GN-6   | 2                      | 35.4             | 38.2              | 365             | Mortality                          | 0.823                         |
| DLO1-20-AC-45 | DLO1-GN-6   | 2                      | 35.5             | 38.6              | 420             | Mortality                          | 0.939                         |
| DLO1-20-AC-46 | DLO1-GN-6   | 2                      | 37.4             | 40.7              | 430             | Mortality                          | 0.822                         |
| DLO1-20-AC-47 | DLO1-GN-2C  | 2                      | 49.5             | 54.0              | 1,050           | -                                  | 0.866                         |
| DLO1-20-AC-48 | DLO1-GN-2C  | 2                      | 36.5             | 39.5              | 430             | -                                  | 0.884                         |
| DLO1-20-AC-49 | DLO1-GN-2C  | 2                      | 27.3             | 29.7              | 194             | -                                  | 0.953                         |
| DLO1-20-AC-50 | DLO1-GN-2C  | 2                      | 33.6             | 36.8              | 365             | -                                  | 0.962                         |
| DLO1-20-AC-51 | DLO1-GN-7A  | 2                      | 30.2             | 32.6              | 250             | Top caudal fin damaged             | 0.908                         |
| DLO1-20-AC-52 | DLO1-GN-7A  | 2                      | 31.2             | 34.3              | 275             | Mortality                          | 0.905                         |
| DLO1-20-AC-53 | DLO1-GN-7A  | 1½                     | 23.4             | 25.5              | 135             | -                                  | 1.054                         |
| DLO1-20-AC-54 | DLO1-GN-8A  | 3                      | 38.9             | 42.0              | 480             | -                                  | 0.815                         |
| DLO1-20-AC-55 | DLO1-GN-8A  | 3                      | 36.1             | 38.9              | 490             | -                                  | 1.042                         |
| DLO1-20-AC-56 | DLO1-GN-8A  | 3                      | 31.7             | 34.6              | 270             | -                                  | 0.848                         |
| DLO1-20-AC-57 | DLO1-GN-8A  | 3                      | 62.0             | 66.0              | 2,010           | -                                  | 0.843                         |
| DLO1-20-AC-58 | DLO1-GN-8A  | 3                      | 41.1             | 45.7              | 595             | -                                  | 0.857                         |
| DLO1-20-AC-59 | DLO1-GN-8A  | 3                      | 56.4             | 60.7              | 1,545           | -                                  | 0.861                         |
| DLO1-20-AC-60 | DLO1-GN-8A  | 2                      | 51.8             | 56.0              | 1,025           | Mortality                          | 0.737                         |
| DLO1-20-AC-61 | DLO1-GN-8A  | 2                      | 32.1             | 35.0              | 305             | -                                  | 0.922                         |
| DLO1-20-AC-62 | DLO1-GN-8A  | 2                      | 40.5             | 44.4              | 636             | Mortality                          | 0.957                         |
| DLO1-20-AC-63 | DLO1-GN-8A  | 2                      | 31.0             | 34.0              | 255             | -                                  | 0.856                         |
| DLO1-20-AC-64 | DLO1-GN-8A  | 2                      | 41.8             | 44.8              | 550             | -                                  | 0.753                         |
| DLO1-20-AC-65 | DLO1-GN-8A  | 1½                     | 61.0             | 64.7              | 2,015           | -                                  | 0.888                         |
| DLO1-20-AC-66 | DLO1-GN-8A  | 1½                     | 32.5             | 35.5              | 305             | -                                  | 0.888                         |
| DLO1-20-AC-67 | DLO1-GN-9A  | 2                      | 54.2             | 68.3              | 2,010           | -                                  | 1.262                         |
| DLO1-20-AC-68 | DLO1-GN-9A  | 2                      | 34.1             | 37.0              | 355             | Mortality                          | 0.895                         |
| DLO1-20-AC-69 | DLO1-GN-9A  | 2                      | 37.7             | 41.1              | 460             | Lateral sides scratched            | 0.858                         |
| DLO1-20-AC-70 | DLO1-GN-9A  | 3                      | 40.9             | 45.1              | 545             | -                                  | 0.797                         |
| DLO1-20-AC-71 | DLO1-GN-10A | 3                      | 38.1             | 41.4              | 470             | -                                  | 0.850                         |
| DLO1-20-AC-72 | DLO1-GN-10A | 3                      | 37.9             | 41.1              | 460             | -                                  | 0.845                         |
| DLO1-20-AC-73 | DLO1-GN-10A | 2                      | 34.9             | 38.2              | 405             | -                                  | 0.953                         |
| DLO1-20-AC-74 | DLO1-GN-10A | 2                      | 33.1             | 35.9              | 305             | Mortality, lateral sides scratched | 0.841                         |
| DLO1-20-AC-75 | DLO1-GN-10A | 2                      | 33.3             | 36.0              | 350             | Mortality                          | 0.948                         |
| DLO1-20-AC-76 | DLO1-GN-7B  | 1½                     | 41.5             | 44.5              | 695             | -                                  | 0.972                         |
| DLO1-20-AC-77 | DLO1-GN-7B  | 1½                     | 36.5             | 39.5              | 400             | -                                  | 0.823                         |
| DLO1-20-AC-78 | DLO1-GN-8B  | 3                      | 62.3             | 69.9              | 2,025           | -                                  | 0.837                         |
| DLO1-20-AC-79 | DLO1-GN-8B  | 2                      | 36.2             | 39.4              | 430             | Mortality                          | 0.906                         |
| DLO1-20-AC-80 | DLO1-GN-8B  | 1½                     | 34.2             | 37.0              | 390             | -                                  | 0.975                         |
| DLO1-20-AC-81 | DLO1-GN-9B  | 2                      | 39.1             | 42.1              | 540             | -                                  | 0.903                         |
| DLO1-20-AC-82 | DLO1-GN-9B  | 2                      | 52.6             | 56.7              | 1,250           | -                                  | 0.859                         |
| DLO1-20-AC-83 | DLO1-GN-10B | 1½                     | 20.1             | 21.7              | 60              | -                                  | 0.739                         |
| DLO1-20-AC-84 | DLO1-GN-10B | 1½                     | 24.5             | 26.6              | 145             | -                                  | 0.986                         |
| DLO1-20-AC-85 | DLO1-GN-10B | 1½                     | 38.7             | 41.7              | 495             | -                                  | 0.854                         |
| DLO1-20-AC-86 | DLO1-GN-10B | 1½                     | 30.6             | 33.1              | 270             | Mortality                          | 0.942                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.17: Arctic Charr Measurements from Fish Captured at Sheardown Lake NW by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID                  | Net ID                    | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities      | Fulton's Condition Factor (K) |
|------------------------------|---------------------------|------------------------|------------------|-------------------|-----------------|--------------------|-------------------------------|
| DLO1-20-AC-87                | DLO1-GN-10B               | 3                      | 43.9             | 47.9              | 715             | -                  | 0.845                         |
| DLO1-20-AC-88                | DLO1-GN-8C                | 2                      | 43.4             | 46.5              | 715             | Lesion on left jaw | 0.875                         |
| DLO1-20-AC-89                | DLO1-GN-8C                | 2                      | 57.4             | 60.0              | 2,106           | -                  | 1.114                         |
| DLO1-20-AC-90                | DLO1-GN-8C                | 2                      | 37.7             | 40.8              | 545             | Mortality          | 1.017                         |
| DLO1-20-AC-91                | DLO1-GN-9C                | 3                      | 38.9             | 42.1              | 550             | -                  | 0.934                         |
| DLO1-20-AC-92                | DLO1-GN-9C                | 2                      | 33.6             | 36.6              | 340             | Mortality          | 0.896                         |
| DLO1-20-AC-93                | DLO1-GN-9C                | 2                      | 53.2             | 56.7              | 1,300           | -                  | 0.863                         |
| DLO1-20-AC-94                | DLO1-GN-10C               | 3                      | 37.5             | 40.5              | 490             | -                  | 0.929                         |
| DLO1-20-AC-95                | DLO1-GN-10C               | 2                      | 38.1             | 41.0              | 450             | -                  | 0.814                         |
| DLO1-20-AC-96                | DLO1-GN-10C               | 2                      | 33.4             | 36.0              | 320             | -                  | 0.859                         |
| DLO1-20-AC-97                | DLO1-GN-10C               | 2                      | 37.3             | 40.2              | 505             | Mortality          | 0.973                         |
| DLO1-20-AC-98                | DLO1-GN-8D                | 2                      | 34.1             | 37.1              | 340             | -                  | 0.857                         |
| <b>Overall Catch Summary</b> | <b>Sample Size (N)</b>    |                        | <b>98</b>        | <b>98</b>         | <b>98</b>       | <b>-</b>           | <b>98</b>                     |
|                              | <b>Average</b>            |                        | <b>39.0</b>      | <b>42.3</b>       | <b>621</b>      | <b>-</b>           | <b>0.890</b>                  |
|                              | <b>Median</b>             |                        | <b>36.6</b>      | <b>39.6</b>       | <b>438</b>      | <b>-</b>           | <b>0.885</b>                  |
|                              | <b>Standard Deviation</b> |                        | <b>9.56</b>      | <b>10.4</b>       | <b>506</b>      | <b>-</b>           | <b>0.085</b>                  |
|                              | <b>Standard Error</b>     |                        | <b>0.965</b>     | <b>1.05</b>       | <b>51</b>       | <b>-</b>           | <b>0.009</b>                  |
|                              | <b>Minimum</b>            |                        | <b>19.0</b>      | <b>20.7</b>       | <b>60</b>       | <b>-</b>           | <b>0.655</b>                  |
|                              | <b>Maximum</b>            |                        | <b>65.4</b>      | <b>69.9</b>       | <b>2,380</b>    | <b>-</b>           | <b>1.262</b>                  |

Note: "-" indicates measurement not taken or no comment.

**Table G.18: Results of Littoral/Profundal Arctic Charr Health Endpoint Statistical Comparisons between 2020 Sheardown Lake NW (DLO1) and 2020 Reference Lake 3 (REF) Data, and for Sheardown Lake NW between 2020 and the Mine Baseline Period (2006 to 2013), Mary River Project 2020 CREMP**

| Comparison                                      | Indicator             | Endpoint                      | Variables            |                       | Sample Size           |                 | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |                       |           | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|-------------------------------------------------|-----------------------|-------------------------------|----------------------|-----------------------|-----------------------|-----------------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|-----------------------|-----------|--------------|--------------------------------------------|
|                                                 |                       |                               | Response             | Covariate             | REF 2020 or DLO1 Base | DLO1 2020       |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |                       |           |              |                                            |
|                                                 |                       |                               |                      |                       |                       |                 |        | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF 2020 or DLO1 Base | DLO1 2020 |              |                                            |
| Sheardown Lake NW versus Reference Lake 3, 2020 | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 69                    | 98              | K-S    | -                       | -                    | -                                            | -                               | -                     | -         | <0.001       | -                                          |
|                                                 | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 69                    | 98              | M-W    | -                       | -                    | -                                            | Median                          | 30.9                  | 36.6      | <0.001       | 18                                         |
|                                                 |                       | Body Weight                   | Body Weight (g)      | -                     | 69                    | 98              | M-W    | -                       | -                    | -                                            | Median                          | 225                   | 438       | <0.001       | 94                                         |
|                                                 | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 69                    | 98              | ANCOVA | 0.032 <sup>e</sup>      | <0.001               | 35.4                                         | Adjusted Mean                   | 351                   | 391       | <0.001       | 12                                         |
|                                                 |                       | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 68 <sup>f</sup>       | 97 <sup>g</sup> | ANCOVA | 0.009 <sup>h</sup>      | <0.001               | 35.3                                         | Adjusted Mean                   | 351                   | 389       | <0.001       | 11                                         |
| Sheardown Lake NW 2020 versus Baseline          | Survival              | Length Frequency Distribution | Fork Length (cm)     | -                     | 98                    | 98              | K-S    | -                       | -                    | -                                            | -                               | -                     | -         | 0.270        | -                                          |
|                                                 | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 98                    | 98              | M-W    | -                       | -                    | -                                            | Median                          | 35.8                  | 36.6      | 0.174        | -                                          |
|                                                 |                       | Body Weight                   | Body Weight (g)      | -                     | 98                    | 98              | M-W    | -                       | -                    | -                                            | Median                          | 400                   | 438       | 0.131        | -                                          |
|                                                 | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 98                    | 98              | ANCOVA | 0.818                   | <0.001               | 36.7                                         | Adjusted Mean                   | 428                   | 439       | 0.160        | -                                          |

 Area P-value < 0.1 or Interaction P-value < 0.05

 Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CFRDs was observed.

<sup>e</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9829 and R2 of parallel slope model = 0.9824; a difference < 0.02) following Environment Canada (2012).

<sup>f</sup> One outlier (REF3-20-AC-03 Stdnt resid: -4.707) was removed from the analysis.

<sup>g</sup> One outlier (DLO1-20-AC-67 Stdnt resid: 4.045) was removed from the analysis.

<sup>h</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9829 and R2 of parallel slope model = 0.9824; a difference < 0.02) following Environment Canada (2012).

**Table G.19: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|----------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| DLO2-20-ACJ-01 | 4.2              | 4.4               | 0.685           | -           | 0.925                         |
| DLO2-20-ACJ-02 | 4.3              | 4.5               | 0.901           | -           | 1.133                         |
| DLO2-20-ACJ-03 | 7.7              | 8.2               | 4.064           | -           | 0.890                         |
| DLO2-20-ACJ-04 | 4.7              | 4.9               | 0.942           | -           | 0.907                         |
| DLO2-20-ACJ-05 | 7.2              | 7.6               | 3.403           | -           | 0.912                         |
| DLO2-20-ACJ-06 | 14.1             | 15.4              | 22.644          | 5           | 0.808                         |
| DLO2-20-ACJ-07 | 9.1              | 9.9               | 7.282           | -           | 0.966                         |
| DLO2-20-ACJ-08 | 8.6              | 9.2               | 5.606           | -           | 0.881                         |
| DLO2-20-ACJ-09 | 8.1              | 8.7               | 4.791           | -           | 0.902                         |
| DLO2-20-ACJ-10 | 7.9              | 8.4               | 4.118           | -           | 0.835                         |
| DLO2-20-ACJ-11 | 9.0              | 9.7               | 7.466           | -           | 1.024                         |
| DLO2-20-ACJ-12 | 7.9              | 8.5               | 5.209           | -           | 1.057                         |
| DLO2-20-ACJ-13 | 8.2              | 8.9               | 5.031           | -           | 0.912                         |
| DLO2-20-ACJ-14 | 8.1              | 8.7               | 5.241           | -           | 0.986                         |
| DLO2-20-ACJ-15 | 8.4              | 8.9               | 5.496           | -           | 0.927                         |
| DLO2-20-ACJ-16 | 8.0              | 8.5               | 4.501           | -           | 0.879                         |
| DLO2-20-ACJ-17 | 8.6              | 9.2               | 5.900           | -           | 0.928                         |
| DLO2-20-ACJ-18 | 7.5              | 7.9               | 4.037           | -           | 0.957                         |
| DLO2-20-ACJ-19 | 8.2              | 8.8               | 5.069           | -           | 0.919                         |
| DLO2-20-ACJ-20 | 4.2              | 4.3               | 0.727           | -           | 0.981                         |
| DLO2-20-ACJ-21 | 4.4              | 4.5               | 0.826           | -           | 0.970                         |
| DLO2-20-ACJ-22 | 8.0              | 8.5               | 4.777           | -           | 0.933                         |
| DLO2-20-ACJ-23 | 4.6              | 4.8               | 0.911           | -           | 0.936                         |
| DLO2-20-ACJ-24 | 4.7              | 4.9               | 0.953           | -           | 0.918                         |
| DLO2-20-ACJ-25 | 4.1              | 4.2               | 0.644           | -           | 0.934                         |
| DLO2-20-ACJ-26 | 8.0              | 8.6               | 5.042           | -           | 0.985                         |
| DLO2-20-ACJ-27 | 4.2              | 4.3               | 0.712           | -           | 0.961                         |
| DLO2-20-ACJ-28 | 7.2              | 7.6               | 3.324           | -           | 0.891                         |
| DLO2-20-ACJ-29 | 8.5              | 9.1               | 5.606           | -           | 0.913                         |
| DLO2-20-ACJ-30 | 4.5              | 4.7               | 0.845           | -           | 0.927                         |
| DLO2-20-ACJ-31 | 12.6             | 13.6              | 16.742          | -           | 0.837                         |
| DLO2-20-ACJ-32 | 4.2              | 4.3               | 0.665           | -           | 0.898                         |
| DLO2-20-ACJ-33 | 7.7              | 8.2               | 4.755           | -           | 1.042                         |
| DLO2-20-ACJ-34 | 4.2              | 4.3               | 0.658           | -           | 0.888                         |
| DLO2-20-ACJ-35 | 10.9             | 11.8              | 12.369          | -           | 0.955                         |
| DLO2-20-ACJ-36 | 6.4              | 6.8               | 2.462           | -           | 0.939                         |
| DLO2-20-ACJ-37 | 8.3              | 8.9               | 5.388           | -           | 0.942                         |
| DLO2-20-ACJ-38 | 7.9              | 8.4               | 5.500           | -           | 1.116                         |
| DLO2-20-ACJ-39 | 9.2              | 9.9               | 6.549           | -           | 0.841                         |
| DLO2-20-ACJ-40 | 4.1              | 4.2               | 0.641           | -           | 0.930                         |
| DLO2-20-ACJ-41 | 7.7              | 8.2               | 4.508           | -           | 0.987                         |
| DLO2-20-ACJ-42 | 7.8              | 8.3               | 4.182           | -           | 0.881                         |
| DLO2-20-ACJ-43 | 4.5              | 4.7               | 0.927           | -           | 1.017                         |
| DLO2-20-ACJ-44 | 8.2              | 8.7               | 4.926           | 1           | 0.893                         |
| DLO2-20-ACJ-45 | 4.8              | 5.0               | 1.029           | 0           | 0.930                         |
| DLO2-20-ACJ-46 | 7.9              | 8.5               | 4.966           | 1           | 1.007                         |
| DLO2-20-ACJ-47 | 8.3              | 8.8               | 5.463           | 1           | 0.955                         |
| DLO2-20-ACJ-48 | 9.8              | 10.5              | 8.005           | 2           | 0.851                         |
| DLO2-20-ACJ-49 | 5.1              | 5.3               | 1.223           | 0           | 0.922                         |
| DLO2-20-ACJ-50 | 6.2              | 6.5               | 2.250           | 1           | 0.944                         |
| DLO2-20-ACJ-51 | 10.0             | 10.7              | 8.649           | 2           | 0.865                         |
| DLO2-20-ACJ-52 | 14.4             | 15.6              | 23.546          | 4           | 0.789                         |
| DLO2-20-ACJ-53 | 4.3              | 4.5               | 0.753           | -           | 0.947                         |
| DLO2-20-ACJ-54 | 14.1             | 15.3              | 24.999          | -           | 0.892                         |
| DLO2-20-ACJ-55 | 11.0             | 11.8              | 11.279          | -           | 0.847                         |
| DLO2-20-ACJ-56 | 6.5              | 6.9               | 2.760           | -           | 1.005                         |
| DLO2-20-ACJ-57 | 4.5              | 4.7               | 0.934           | -           | 1.025                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.19: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID                     |                    | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------------------------|--------------------|------------------|-------------------|-----------------|-------------|-------------------------------|
| DLO2-20-ACJ-58                  |                    | 10.3             | 11.1              | 9.169           | -           | 0.839                         |
| DLO2-20-ACJ-59                  |                    | 8.2              | 8.7               | 6.186           | -           | 1.122                         |
| DLO2-20-ACJ-60                  |                    | 9.5              | 10.2              | 7.100           | -           | 0.828                         |
| DLO2-20-ACJ-61                  |                    | 8.8              | 9.4               | 5.665           | -           | 0.831                         |
| DLO2-20-ACJ-62                  |                    | 7.6              | 8.1               | 4.990           | -           | 1.137                         |
| DLO2-20-ACJ-63                  |                    | 8.8              | 9.3               | 6.787           | -           | 0.996                         |
| DLO2-20-ACJ-64                  |                    | 9.5              | 10.1              | 8.550           | -           | 0.997                         |
| DLO2-20-ACJ-65                  |                    | 7.9              | 8.4               | 4.357           | -           | 0.884                         |
| DLO2-20-ACJ-66                  |                    | 9.2              | 9.8               | 7.659           | -           | 0.984                         |
| DLO2-20-ACJ-67                  |                    | 13.9             | 15.0              | 20.854          | -           | 0.777                         |
| DLO2-20-ACJ-68                  |                    | 9.5              | 10.1              | 7.368           | -           | 0.859                         |
| DLO2-20-ACJ-69                  |                    | 4.9              | 5.1               | 1.002           | -           | 0.852                         |
| DLO2-20-ACJ-70                  |                    | 7.9              | 8.4               | 4.807           | -           | 0.975                         |
| DLO2-20-ACJ-71                  |                    | 6.9              | 7.3               | 3.089           | -           | 0.940                         |
| DLO2-20-ACJ-72                  |                    | 8.9              | 9.4               | 6.559           | -           | 0.930                         |
| DLO2-20-ACJ-73                  |                    | 7.5              | 8.0               | 4.038           | -           | 0.957                         |
| DLO2-20-ACJ-74                  |                    | 7.8              | 8.3               | 4.184           | -           | 0.882                         |
| DLO2-20-ACJ-75                  |                    | 10.5             | 11.3              | 10.180          | -           | 0.879                         |
| DLO2-20-ACJ-76                  |                    | 8.2              | 8.7               | 4.756           | -           | 0.863                         |
| DLO2-20-ACJ-77                  |                    | 7.7              | 8.2               | 4.234           | -           | 0.927                         |
| DLO2-20-ACJ-78                  |                    | 4.7              | 4.9               | 1.114           | -           | 1.073                         |
| DLO2-20-ACJ-79                  |                    | 6.4              | 6.9               | 3.014           | -           | 1.150                         |
| DLO2-20-ACJ-80                  |                    | 4.3              | 4.4               | 0.650           | -           | 0.818                         |
| DLO2-20-ACJ-81                  |                    | 8.1              | 8.6               | 5.512           | -           | 1.037                         |
| DLO2-20-ACJ-82                  |                    | 8.6              | 9.2               | 6.263           | -           | 0.985                         |
| DLO2-20-ACJ-83                  |                    | 4.9              | 5.1               | 1.111           | -           | 0.944                         |
| DLO2-20-ACJ-84                  |                    | 7.0              | 7.4               | 3.030           | -           | 0.883                         |
| DLO2-20-ACJ-85                  |                    | 10.1             | 10.9              | 10.236          | -           | 0.993                         |
| DLO2-20-ACJ-86                  |                    | 7.8              | 8.3               | 4.538           | -           | 0.956                         |
| DLO2-20-ACJ-87                  |                    | 9.2              | 9.9               | 7.853           | -           | 1.008                         |
| DLO2-20-ACJ-88                  |                    | 8.4              | 9.0               | 6.501           | -           | 1.097                         |
| DLO2-20-ACJ-89                  |                    | 8.3              | 8.9               | 6.113           | -           | 1.069                         |
| DLO2-20-ACJ-90                  |                    | 7.7              | 8.1               | 3.950           | -           | 0.865                         |
| DLO2-20-ACJ-91                  |                    | 7.0              | 7.5               | 2.922           | -           | 0.852                         |
| DLO2-20-ACJ-92                  |                    | 4.5              | 4.7               | 0.746           | -           | 0.819                         |
| DLO2-20-ACJ-93                  |                    | 6.8              | 7.2               | 2.742           | -           | 0.872                         |
| DLO2-20-ACJ-94                  |                    | 8.3              | 8.8               | 5.335           | -           | 0.933                         |
| DLO2-18-ACJ-95                  |                    | 8.0              | 8.5               | 4.659           | -           | 0.910                         |
| DLO2-18-ACJ-96                  |                    | 8.8              | 9.4               | 6.169           | -           | 0.905                         |
| DLO2-18-ACJ-97                  |                    | 8.6              | 9.2               | 6.852           | -           | 1.077                         |
| DLO2-18-ACJ-98                  |                    | 4.5              | 4.7               | 0.898           | -           | 0.985                         |
| DLO2-18-ACJ-99                  |                    | 9.6              | 10.3              | 7.566           | -           | 0.855                         |
| DLO2-18-ACJ-100                 |                    | 8.4              | 9.0               | 5.726           | -           | 0.966                         |
| Overall Catch Summary           | Sample Size (N)    | 100              | 100               | 100             | 10          | 100                           |
|                                 | Average            | 7.7              | 8.2               | 5.279           | 1.7         | 0.938                         |
|                                 | Median             | 7.9              | 8.5               | 4.784           | 1.0         | 0.930                         |
|                                 | Standard Deviation | 2.3              | 2.6               | 4.681           | 1.6         | 0.080                         |
|                                 | Standard Error     | 0.23             | 0.26              | 0.468           | 0.52        | 0.008                         |
|                                 | Minimum            | 4.1              | 4.2               | 0.641           | 0.0         | 0.777                         |
|                                 | Maximum            | 14.4             | 15.6              | 24.999          | 5.0         | 1.150                         |
| Young-of-the-Year Catch Summary | proportion of YOY  | 24%              |                   |                 |             |                               |
|                                 | Sample Size (N)    | 24               | 24                | 24              | 2           | 24                            |
|                                 | Average            | 4.5              | 4.6               | 0.854           | 0           | 0.943                         |
|                                 | Median             | 4.5              | 4.7               | 0.872           | 0           | 0.932                         |
|                                 | Standard Deviation | 0.3              | 0.3               | 0.168           | 0           | 0.072                         |
|                                 | Standard Error     | 0.1              | 0.1               | 0.034           | 0           | 0.015                         |
|                                 | Minimum            | 4.1              | 4.2               | 0.641           | 0           | 0.818                         |
|                                 | Maximum            | 5.1              | 5.3               | 1.223           | 0           | 1.133                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.20: Results of Nearshore Arctic Charr Non-Young-of-the-Year (YOY) Health Endpoint Statistical Comparisons between Sheardown Lake SE (DLO-02) and Reference Lake 3 (REF), Mary River Project CREMP, August 2020**

| Group    | Indicator                | Endpoint                      | Variables            |                       | Sample Size     |        | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |       |        | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|----------|--------------------------|-------------------------------|----------------------|-----------------------|-----------------|--------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|-------|--------|--------------|--------------------------------------------|
|          |                          |                               | Response             | Covariate             | REF             | DLO-02 |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |       |        |              |                                            |
|          |                          |                               |                      |                       |                 |        |        | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF   | DLO-02 |              |                                            |
| All Fish | Recruitment/<br>Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 100             | 100    | K-S    | -                       | -                    | -                                            | -                               | -     | -      | 0.006        | -                                          |
| YOY      | Body Size                | Fork Length                   | Fork Length (cm)     | -                     | 21              | 24     | tequal | -                       | -                    | -                                            | Mean                            | 3.60  | 4.47   | <0.001       | 24                                         |
|          |                          | Body Weight                   | Body Weight (g)      | -                     | 21              | 24     | tequal | -                       | -                    | -                                            | Mean                            | 0.388 | 0.854  | <0.001       | 120                                        |
|          | Energy Storage           | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 21              | 24     | ANCOVA | 0.339                   | <0.001               | 4.03                                         | Adjusted Mean                   | 0.535 | 0.607  | 0.01         | 13                                         |
|          |                          | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 20 <sup>e</sup> | 24     | ANCOVA | 0.437                   | <0.001               | 4.04                                         | Adjusted Mean                   | 0.525 | 0.614  | <0.001       | 17                                         |
| Non-YOY  | Survival                 | Length Frequency Distribution | Fork Length (cm)     | -                     | 79              | 76     | K-S    | -                       | -                    | -                                            | -                               | -     | -      | <0.001       | -                                          |
|          | Body Size                | Fork Length                   | Fork Length (cm)     | -                     | 79              | 76     | M-W    | -                       | -                    | -                                            | Median                          | 7.70  | 8.20   | <0.001       | 6.5                                        |
|          |                          | Body Weight                   | Body Weight (g)      | -                     | 79              | 76     | M-W    | -                       | -                    | -                                            | Median                          | 3.55  | 5.43   | <0.001       | 53                                         |
|          | Energy Storage           | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 79              | 76     | ANCOVA | <0.001 <sup>f</sup>     | <0.001               | 8.13                                         | Adjusted Mean                   | 4.41  | 5.03   | <0.001       | 14                                         |

Area P-value < 0.1 or Interaction P-value < 0.05

Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>a</sup>

The median, mean (geometric mean for log<sup>10</sup>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate

<sup>b</sup>

(where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup>

The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in

covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup>

Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CRFDs was observed.

<sup>e</sup>

One outlier (REF3-20-ACJ-55, Stdnt resid: 4.035) removed from analysis.

<sup>f</sup>

ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9856 and R2 of parallel slope model = 0.9845; a difference < 0.02) following Environment Canada (2012).

**Table G.21: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Sheardown Lake SE (DLO-02) Using 2020 Data Relative to Reference Lake 3 Data (2020) or Sheardown Lake SE Baseline Data (2006 to 2013) with  $\alpha=\beta=0.1$ , Mary River Project 2020 CREMP**

| Comparison                                                                   | Group    | Indicator      | Endpoint               | Variables            |                       | Test <sup>a</sup> | S <sup>b</sup> | COV (%) <sup>c</sup> | Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1 |          |     |      |      |      |      |      |      |      |
|------------------------------------------------------------------------------|----------|----------------|------------------------|----------------------|-----------------------|-------------------|----------------|----------------------|-------------------------------------------------------------------------------------------------------|----------|-----|------|------|------|------|------|------|------|
|                                                                              |          |                |                        | Response             | Covariate             |                   |                |                      | log(Response)                                                                                         | 5%       | 10% | 20%  | 25%  | 30%  | 33%  | 40%  | 50%  | 100% |
|                                                                              |          |                |                        |                      |                       |                   |                |                      |                                                                                                       | -5%      | -9% | -17% | -20% | -23% | -25% | -29% | -33% | -50% |
|                                                                              |          |                |                        |                      |                       |                   |                |                      |                                                                                                       | Response | ±5% | ±10% | ±20% | ±25% | ±30% | ±33% | ±40% | ±50% |
| Nearshore Arctic Charr (Electrofishing) versus Ref. Lake 3, 2020 Data        | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)     | -                     | M-W               | 0.0879         | 23.8                 | Response                                                                                              | 343      | 91  | 26   | 18   | 13   | 12   | 9    | 6    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)      | -                     | M-W               | 0.259          | 110                  | Response                                                                                              | 2,966    | 778 | 215  | 144  | 105  | 87   | 64   | 44   | 17   |
|                                                                              |          | Energy Storage | Condition              | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0342         | -                    | log(Response)                                                                                         | 47       | 14  | 6    | 5    | 4    | 4    | 4    | 3    | 3    |
| Nearshore Arctic Charr (Electrofishing) 2020 versus Baseline                 | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)     | -                     | M-W               | 0.0709         | 24.8                 | Response                                                                                              | 224      | 60  | 18   | 12   | 10   | 9    | 6    | 5    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)      | -                     | M-W               | 0.210          | 163                  | Response                                                                                              | 1,947    | 512 | 142  | 95   | 69   | 58   | 43   | 31   | 12   |
|                                                                              |          | Energy Storage | Condition              | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0528         | -                    | log(Response)                                                                                         | 108      | 30  | 10   | 7    | 6    | 5    | 5    | 4    | 3    |
|                                                                              |          |                | Condition <sup>d</sup> | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0417         | -                    | log(Response)                                                                                         | 69       | 20  | 7    | 6    | 5    | 4    | 4    | 4    | 3    |
| Littoral/Profundal Arctic Charr (Gill Netting) versus Ref. Lake 3, 2020 Data | All fish | Body Size      | Fork Length            | Fork Length (cm)     | -                     | M-W               | 0.0828         | 20.9                 | Response                                                                                              | 305      | 82  | 24   | 16   | 12   | 10   | 7    | 5    | 4    |
|                                                                              |          |                | Body Weight            | Body Weight (g)      | -                     | M-W               | 0.258          | 78.8                 | Response                                                                                              | 2,933    | 770 | 212  | 142  | 104  | 86   | 63   | 44   | 14   |
|                                                                              |          | Energy Storage | Condition              | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0478         | -                    | log(Response)                                                                                         | 90       | 25  | 9    | 7    | 5    | 5    | 4    | 4    | 3    |
|                                                                              |          |                | Condition <sup>e</sup> | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0453         | -                    | log(Response)                                                                                         | 81       | 23  | 8    | 6    | 5    | 5    | 4    | 4    | 3    |
| Littoral/Profundal Arctic Charr (Gill Netting) 2020 versus Baseline          | All fish | Body Size      | Fork Length            | Fork Length (cm)     | -                     | M-W               | 0.0617         | 12.4                 | Response                                                                                              | 123      | 32  | 10   | 7    | 5    | 5    | 4    | 4    | 3    |
|                                                                              |          |                | Body Weight            | Body Weight (g)      | -                     | M-W               | 0.193          | 31.9                 | Response                                                                                              | 806      | 203 | 53   | 34   | 25   | 20   | 14   | 10   | 4    |
|                                                                              |          | Energy Storage | Condition              | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0477         | -                    | log(Response)                                                                                         | 89       | 25  | 9    | 7    | 5    | 5    | 4    | 4    | 3    |
|                                                                              |          |                | Condition <sup>f</sup> | log[Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0455         | -                    | log(Response)                                                                                         | 81       | 23  | 8    | 6    | 5    | 5    | 4    | 4    | 3    |

<sup>a</sup> Sample size estimates for the M-W test were estimated based for a two-sample t-test using sample sizes multiplied by 0.864. The 0.864 is the lower bound of the asymptotic relative efficiency of the Mann-Whitney test and the two-sample t-test (Hodges and Lehmann 1956). Estimates were generated for the response variable on the untransformed and log<sub>10</sub>-transformed scales and the lowest sample size is reported.

<sup>b</sup> Pooled standard deviation of the regression residuals

<sup>c</sup> Coefficient of variation (pooled standard deviation/reference mean)×100%

<sup>d</sup> One outlier (SLSE-07-1 Stdnt resid:-4.398; SLSE-07-2 Stdnt resid: -4.398) removed from analysis.

<sup>e</sup> One outlier (REF3-20-AC-03, Stdnt resid: -4.445) was removed from the analysis.

<sup>f</sup> One outlier (SLSE-08-AC-11, Stdnt resid: 4.136) was removed from the analysis.



**Table G.22: Gill Netting Catch Records for Sheardown Lake SE, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location (NAD83, UTM Zone 17W) |          | Length (m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort (m*hrs/100 m) | Arctic Charr Catch Per Mesh Size |    |    | Total Catch | CPUE  |
|-----------------|--------------------------------|----------|------------|-----------|-----------|----------|-----------|---------------|----------------------|----------------------------------|----|----|-------------|-------|
|                 | Easting                        | Northing |            |           |           |          |           |               |                      | 1½"                              | 2" | 3" |             |       |
| DLO2-20-GN-1A   | 560768                         | 7912286  | 91.4       | 10-Aug-20 | 10-Aug-20 | 9:18     | 10:22     | 1.07          | 0.975                | 1                                | 0  | 1  | 2           | 2.05  |
| DLO2-20-GN-1B   | 560768                         | 7912286  | 91.4       | 10-Aug-20 | 10-Aug-20 | 10:36    | 12:23     | 1.78          | 1.63                 | 2                                | 3  | 1  | 6           | 3.68  |
| DLO2-20-GN-1C   | 560768                         | 7912286  | 91.4       | 10-Aug-20 | 10-Aug-20 | 12:45    | 13:57     | 1.20          | 1.10                 | 0                                | 2  | 2  | 4           | 3.65  |
| DLO2-20-GN-1D   | 560768                         | 7912286  | 91.4       | 10-Aug-20 | 10-Aug-20 | 14:19    | 16:04     | 1.75          | 1.60                 | 1                                | 1  | 0  | 2           | 1.25  |
| DLO2-20-GN-2A   | 561155                         | 7911991  | 91.4       | 10-Aug-20 | 10-Aug-20 | 9:30     | 10:44     | 1.23          | 1.13                 | 1                                | 3  | 5  | 9           | 7.98  |
| DLO2-20-GN-2B   | 561155                         | 7911991  | 91.4       | 10-Aug-20 | 10-Aug-20 | 11:26    | 12:55     | 1.48          | 1.36                 | 1                                | 0  | 2  | 3           | 2.21  |
| DLO2-20-GN-2C   | 561155                         | 7911991  | 91.4       | 10-Aug-20 | 10-Aug-20 | 13:10    | 14:54     | 1.73          | 1.58                 | 3                                | 6  | 1  | 10          | 6.31  |
| DLO2-20-GN-2D   | 561155                         | 7911991  | 91.4       | 10-Aug-20 | 10-Aug-20 | 15:24    | 16:50     | 1.43          | 1.31                 | 2                                | 1  | 1  | 4           | 3.05  |
| DLO2-20-GN-2E   | 561155                         | 7911991  | 91.4       | 10-Aug-20 | 10-Aug-20 | 17:07    | 17:44     | 0.617         | 0.564                | 0                                | 0  | 0  | 0           | 0     |
| DLO2-20-GN-3A   | 561545                         | 7911868  | 91.4       | 10-Aug-20 | 10-Aug-20 | 9:41     | 11:32     | 1.85          | 1.69                 | 0                                | 6  | 3  | 9           | 5.32  |
| DLO2-20-GN-3B   | 561545                         | 7911868  | 91.4       | 10-Aug-20 | 10-Aug-20 | 12:10    | 13:34     | 1.40          | 1.28                 | 0                                | 1  | 1  | 2           | 1.56  |
| DLO2-20-GN-3C   | 561545                         | 7911868  | 91.4       | 10-Aug-20 | 10-Aug-20 | 13:45    | 15:28     | 1.72          | 1.57                 | 0                                | 2  | 3  | 5           | 3.19  |
| DLO2-20-GN-4A   | 560963                         | 7912119  | 91.4       | 10-Aug-20 | 10-Aug-20 | 12:51    | 14:22     | 1.52          | 1.39                 | 2                                | 1  | 4  | 7           | 5.05  |
| DLO2-20-GN-4B   | 560963                         | 7912119  | 91.4       | 10-Aug-20 | 10-Aug-20 | 14:50    | 16:15     | 1.42          | 1.30                 | 1                                | 0  | 1  | 2           | 1.54  |
| DLO2-20-GN-4C   | 560963                         | 7912119  | 91.4       | 10-Aug-20 | 10-Aug-20 | 16:25    | 17:31     | 1.10          | 1.01                 | 0                                | 1  | 1  | 2           | 1.99  |
| DLO2-20-GN-5    | 561051                         | 7912067  | 91.4       | 10-Aug-20 | 10-Aug-20 | 17:14    | 18:05     | 0.850         | 0.777                | 3                                | 0  | 1  | 4           | 5.15  |
| DLO2-20-GN-6    | 560833                         | 7912227  | 91.4       | 11-Aug-20 | 11-Aug-20 | 15:58    | 16:52     | 0.900         | 0.823                | 0                                | 2  | 1  | 3           | 3.65  |
| DLO2-20-GN-7    | 560987                         | 7912107  | 91.4       | 11-Aug-20 | 11-Aug-20 | 16:04    | 17:07     | 1.05          | 0.960                | 0                                | 0  | 0  | 0           | 0     |
| DLO2-20-GN-8    | 561199                         | 7912003  | 91.4       | 11-Aug-20 | 11-Aug-20 | 16:09    | 17:13     | 1.07          | 0.975                | 1                                | 3  | 7  | 11          | 11.3  |
| DLO2-20-GN-9A   | 561200                         | 7911958  | 91.4       | 13-Aug-20 | 13-Aug-20 | 10:15    | 11:05     | 0.833         | 0.762                | 0                                | 1  | 2  | 3           | 3.94  |
| DLO2-20-GN-9B   | 561200                         | 7911958  | 91.4       | 13-Aug-20 | 13-Aug-20 | 11:19    | 12:11     | 0.867         | 0.792                | 1                                | 2  | 4  | 7           | 8.84  |
| DLO2-20-GN-10A  | 561420                         | 7911938  | 91.4       | 13-Aug-20 | 13-Aug-20 | 10:22    | 11:21     | 0.983         | 0.899                | 0                                | 5  | 1  | 6           | 6.68  |
| DLO2-20-GN-10B  | 561420                         | 7911938  | 91.4       | 13-Aug-20 | 13-Aug-20 | 11:40    | 12:34     | 0.900         | 0.823                | 0                                | 1  | 2  | 3           | 3.65  |
| DLO2-20-GN-11A  | 561479                         | 7911775  | 91.4       | 13-Aug-20 | 13-Aug-20 | 10:30    | 11:43     | 1.22          | 1.11                 | 0                                | 1  | 0  | 1           | 0.899 |
| DLO2-20-GN-11B  | 561479                         | 7911775  | 91.4       | 13-Aug-20 | 13-Aug-20 | 11:50    | 12:48     | 0.967         | 0.884                | 1                                | 0  | 1  | 2           | 2.26  |
| Total           |                                |          |            |           |           |          |           |               | 28.3                 | 20                               | 42 | 45 | 107         | 3.81  |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m·hours of net.



**Table G.23: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID   | Net ID      | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities             | Fulton's Condition Factor (K) |
|---------------|-------------|------------------------|------------------|-------------------|-----------------|---------------------------|-------------------------------|
| DLO2-20-AC-01 | DLO2-GN-1A  | 1½                     | 36.7             | 39.4              | 410             | -                         | 0.829                         |
| DLO2-20-AC-02 | DLO2-GN-1A  | 3                      | 39.2             | 42.4              | 540             | -                         | 0.896                         |
| DLO2-20-AC-03 | DLO2-GN-2A  | 3                      | 33.9             | 36.9              | 305             | Bottom caudal fin clipped | 0.783                         |
| DLO2-20-AC-04 | DLO2-GN-2A  | 3                      | 36.4             | 39.5              | 460             | -                         | 0.954                         |
| DLO2-20-AC-05 | DLO2-GN-2A  | 3                      | 39.6             | 43.0              | 605             | -                         | 0.974                         |
| DLO2-20-AC-06 | DLO2-GN-2A  | 3                      | 38.0             | 41.3              | 495             | -                         | 0.902                         |
| DLO2-20-AC-07 | DLO2-GN-2A  | 3                      | 39.9             | 43.2              | 570             | -                         | 0.897                         |
| DLO2-20-AC-08 | DLO2-GN-2A  | 2                      | 35.6             | 38.7              | 440             | -                         | 0.975                         |
| DLO2-20-AC-09 | DLO2-GN-2A  | 2                      | 35.4             | 37.9              | 425             | Mortality                 | 0.958                         |
| DLO2-20-AC-10 | DLO2-GN-2A  | 2                      | 39.5             | 42.8              | 540             | -                         | 0.876                         |
| DLO2-20-AC-11 | DLO2-GN-2A  | 1½                     | 31.3             | 33.5              | 296             | Mortality                 | 0.965                         |
| DLO2-20-AC-12 | DLO2-GN-3A  | 3                      | 38.5             | 41.6              | 495             | -                         | 0.867                         |
| DLO2-20-AC-13 | DLO2-GN-3A  | 3                      | 37.0             | 40.0              | 520             | -                         | 1.027                         |
| DLO2-20-AC-14 | DLO2-GN-3A  | 3                      | 40.8             | 44.3              | 590             | -                         | 0.869                         |
| DLO2-20-AC-15 | DLO2-GN-3A  | 2                      | 33.0             | 35.5              | 350             | Mortality                 | 0.974                         |
| DLO2-20-AC-16 | DLO2-GN-3A  | 2                      | 39.9             | 42.7              | 505             | -                         | 0.795                         |
| DLO2-20-AC-17 | DLO2-GN-3A  | 2                      | 35.2             | 38.0              | 425             | Mortality                 | 0.974                         |
| DLO2-20-AC-18 | DLO2-GN-3A  | 2                      | 34.0             | 38.0              | 415             | Mortality                 | 1.056                         |
| DLO2-20-AC-19 | DLO2-GN-3A  | 2                      | 28.2             | 30.2              | 195             | -                         | 0.870                         |
| DLO2-20-AC-20 | DLO2-GN-3A  | 2                      | 32.2             | 35.3              | 305             | -                         | 0.914                         |
| DLO2-20-AC-21 | DLO2-GN-9A  | 3                      | 42.1             | 45.9              | 650             | -                         | 0.871                         |
| DLO2-20-AC-22 | DLO2-GN-9A  | 3                      | 38.2             | 41.5              | 490             | -                         | 0.879                         |
| DLO2-20-AC-23 | DLO2-GN-9A  | 2                      | 37.5             | 40.3              | 450             | -                         | 0.853                         |
| DLO2-20-AC-24 | DLO2-GN-10A | 3                      | 36.8             | 40.0              | 465             | -                         | 0.933                         |
| DLO2-20-AC-25 | DLO2-GN-10A | 2                      | 39.0             | 42.4              | 550             | -                         | 0.927                         |
| DLO2-20-AC-26 | DLO2-GN-10A | 2                      | 44.4             | 48.0              | 660             | -                         | 0.754                         |
| DLO2-20-AC-27 | DLO2-GN-10A | 2                      | 38.6             | 41.9              | 440             | -                         | 0.765                         |
| DLO2-20-AC-28 | DLO2-GN-10A | 2                      | 31.8             | 34.5              | 290             | -                         | 0.902                         |
| DLO2-20-AC-29 | DLO2-GN-10A | 2                      | 35.6             | 38.7              | 460             | -                         | 1.020                         |
| DLO2-20-AC-30 | DLO2-GN-11A | 2                      | 37.5             | 40.5              | 520             | -                         | 0.986                         |
| DLO2-20-AC-31 | DLO2-GN-9B  | 3                      | 41.4             | 44.8              | 635             | -                         | 0.895                         |
| DLO2-20-AC-32 | DLO2-GN-9B  | 3                      | 41.6             | 45.6              | 720             | -                         | 1.000                         |
| DLO2-20-AC-33 | DLO2-GN-9B  | 3                      | 35.1             | 38.1              | 435             | -                         | 1.006                         |
| DLO2-20-AC-34 | DLO2-GN-9B  | 3                      | 40.0             | 44.1              | 540             | -                         | 0.844                         |
| DLO2-20-AC-35 | DLO2-GN-9B  | 2                      | 34.6             | 37.5              | 420             | -                         | 1.014                         |
| DLO2-20-AC-36 | DLO2-GN-9B  | 2                      | 34.9             | 38.2              | 410             | Mortality                 | 0.965                         |
| DLO2-20-AC-37 | DLO2-GN-9B  | 1½                     | 39.6             | 43.1              | 555             | -                         | 0.894                         |
| DLO2-20-AC-38 | DLO2-GN-10B | 3                      | 38.2             | 41.3              | 505             | -                         | 0.906                         |
| DLO2-20-AC-39 | DLO2-GN-10B | 3                      | 38.2             | 41.5              | 500             | -                         | 0.897                         |
| DLO2-20-AC-40 | DLO2-GN-10B | 2                      | 35.5             | 30.3              | 415             | -                         | 0.928                         |
| DLO2-20-AC-41 | DLO2-GN-1B  | 3                      | 37.6             | 40.9              | 450             | -                         | 0.847                         |
| DLO2-20-AC-42 | DLO2-GN-1B  | 2                      | 38.7             | 42.1              | 475             | -                         | 0.820                         |
| DLO2-20-AC-43 | DLO2-GN-1B  | 2                      | 28.3             | 30.2              | 225             | -                         | 0.993                         |
| DLO2-20-AC-44 | DLO2-GN-1B  | 2                      | 36.9             | 40.0              | 430             | Mortality                 | 0.856                         |
| DLO2-20-AC-45 | DLO2-GN-1B  | 1½                     | 25.1             | 27.3              | 105             | -                         | 0.664                         |
| DLO2-20-AC-46 | DLO2-GN-1B  | 1½                     | 39.0             | 42.3              | 520             | -                         | 0.877                         |
| DLO2-20-AC-47 | DLO2-GN-2B  | 1½                     | 38.8             | 42.1              | 670             | -                         | 1.147                         |
| DLO2-20-AC-48 | DLO2-GN-2B  | 3                      | 36.7             | 39.8              | 465             | -                         | 0.941                         |
| DLO2-20-AC-49 | DLO2-GN-2B  | 3                      | 37.1             | 40.1              | 540             | -                         | 1.057                         |
| DLO2-20-AC-50 | DLO2-GN-3B  | 3                      | 39.6             | 38.4              | 460             | -                         | 0.741                         |
| DLO2-20-AC-51 | DLO2-GN-3B  | 2                      | 32.5             | 35.3              | 302             | Mortality                 | 0.880                         |
| DLO2-20-AC-52 | DLO2-GN-1C  | 2                      | 35.8             | 38.7              | 385             | Mortality                 | 0.839                         |
| DLO2-20-AC-53 | DLO2-GN-1C  | 2                      | 33.6             | 36.3              | 310             | Mortality                 | 0.817                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.23: Arctic Charr Measurements from Fish Captured at Sheardown Lake SE by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID           | Net ID             | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities                | Fulton's Condition Factor (K) |
|-----------------------|--------------------|------------------------|------------------|-------------------|-----------------|------------------------------|-------------------------------|
| DLO2-20-AC-54         | DLO2-GN-1C         | 3                      | 37.2             | 39.9              | 450             | -                            | 0.874                         |
| DLO2-20-AC-55         | DLO2-GN-1C         | 3                      | 35.2             | 37.6              | 415             | -                            | 0.952                         |
| DLO2-20-AC-56         | DLO2-GN-4A         | 3                      | 35.5             | 40.0              | 495             | Lesions on vent lateral line | 1.106                         |
| DLO2-20-AC-57         | DLO2-GN-4A         | 3                      | 33.6             | 36.3              | 375             | -                            | 0.989                         |
| DLO2-20-AC-58         | DLO2-GN-4A         | 3                      | 27.5             | 29.6              | 213             | Mortality                    | 1.024                         |
| DLO2-20-AC-59         | DLO2-GN-4A         | 3                      | 39.6             | 43.1              | 440             | Mortality                    | 0.709                         |
| DLO2-20-AC-60         | DLO2-GN-4A         | 2                      | 37.7             | 40.9              | 510             | -                            | 0.952                         |
| DLO2-20-AC-61         | DLO2-GN-4A         | 1½                     | 38.5             | 41.4              | 685             | -                            | 1.200                         |
| DLO2-20-AC-62         | DLO2-GN-4A         | 1½                     | 42.6             | 45.0              | 675             | -                            | 0.873                         |
| DLO2-20-AC-63         | DLO2-GN-2C         | 1½                     | 38.6             | 41.5              | 530             | Mortality                    | 0.922                         |
| DLO2-20-AC-64         | DLO2-GN-2C         | 1½                     | 24.9             | 26.8              | 135             | Mortality                    | 0.874                         |
| DLO2-20-AC-65         | DLO2-GN-2C         | 1½                     | 31.5             | 34.1              | 305             | Mortality                    | 0.976                         |
| DLO2-20-AC-66         | DLO2-GN-2C         | 2                      | 37.9             | 41.1              | 500             | -                            | 0.918                         |
| DLO2-20-AC-67         | DLO2-GN-2C         | 2                      | 34.2             | 36.9              | 410             | Mortality                    | 1.025                         |
| DLO2-20-AC-68         | DLO2-GN-2C         | 2                      | 38.4             | 41.4              | 505             | Mortality                    | 0.892                         |
| DLO2-20-AC-69         | DLO2-GN-2C         | 2                      | 37.1             | 40.5              | 510             | Mortality                    | 0.999                         |
| DLO2-20-AC-70         | DLO2-GN-2C         | 2                      | 38.6             | 41.9              | 560             | Mortality                    | 0.974                         |
| DLO2-20-AC-71         | DLO2-GN-2C         | 2                      | 37.6             | 40.5              | 520             | Mortality                    | 0.978                         |
| DLO2-20-AC-72         | DLO2-GN-2C         | 3                      | 40.0             | 43.4              | 685             | -                            | 1.070                         |
| DLO2-20-AC-73         | DLO2-GN-3C         | 2                      | 41.7             | 45.1              | 615             | -                            | 0.848                         |
| DLO2-20-AC-74         | DLO2-GN-3C         | 2                      | 27.0             | 29.6              | 170             | -                            | 0.864                         |
| DLO2-20-AC-75         | DLO2-GN-3C         | 3                      | 37.7             | 40.8              | 495             | -                            | 0.924                         |
| DLO2-20-AC-76         | DLO2-GN-3C         | 3                      | 39.9             | 42.6              | 660             | Mortality                    | 1.039                         |
| DLO2-20-AC-77         | DLO2-GN-3C         | 3                      | 37.6             | 41.5              | 515             | -                            | 0.969                         |
| DLO2-20-AC-78         | DLO2-GN-1D         | 1½                     | 25.5             | 27.6              | 145             | -                            | 0.874                         |
| DLO2-20-AC-79         | DLO2-GN-1D         | 2                      | 38.5             | 42.6              | 565             | Mortality                    | 0.990                         |
| DLO2-20-AC-80         | DLO2-GN-4B         | 1½                     | 30.7             | 33.3              | 223             | -                            | 0.771                         |
| DLO2-20-AC-81         | DLO2-GN-4B         | 3                      | 38.5             | 41.6              | 515             | -                            | 0.902                         |
| DLO2-20-AC-82         | DLO2-GN-2D         | 1½                     | 32.2             | 35.1              | 305             | -                            | 0.914                         |
| DLO2-20-AC-83         | DLO2-GN-2D         | 1½                     | 42.2             | 46.0              | 695             | -                            | 0.925                         |
| DLO2-20-AC-84         | DLO2-GN-2D         | 2                      | 38.0             | 41.4              | 480             | Mortality                    | 0.875                         |
| DLO2-20-AC-85         | DLO2-GN-2D         | 3                      | 42.3             | 44.5              | 720             | -                            | 0.951                         |
| DLO2-20-AC-86         | DLO2-GN-4C         | 3                      | 40.0             | 40.6              | 565             | -                            | 0.883                         |
| DLO2-20-AC-87         | DLO2-GN-4C         | 2                      | 36.2             | 38.9              | 390             | -                            | 0.822                         |
| DLO2-20-AC-88         | DLO2-GN-5          | 3                      | 37.4             | 40.7              | 675             | Mortality                    | 1.290                         |
| DLO2-20-AC-89         | DLO2-GN-5          | 1½                     | 26.0             | 28.2              | 165             | -                            | 0.939                         |
| DLO2-20-AC-90         | DLO2-GN-5          | 1½                     | 24.1             | 26.1              | 135             | -                            | 0.964                         |
| DLO2-20-AC-91         | DLO2-GN-5          | 1½                     | 31.4             | 34.1              | 285             | -                            | 0.921                         |
| DLO2-20-AC-92         | DLO2-GN-6          | 2                      | 27.9             | 30.1              | 220             | -                            | 1.013                         |
| DLO2-20-AC-93         | DLO2-GN-6          | 2                      | 23.9             | 25.7              | 120             | -                            | 0.879                         |
| DLO2-20-AC-94         | DLO2-GN-6          | 3                      | 40.3             | 43.2              | 585             | -                            | 0.894                         |
| DLO2-20-AC-95         | DLO2-GN-8          | 1½                     | 28.8             | 31.4              | 215             | -                            | 0.900                         |
| DLO2-20-AC-96         | DLO2-GN-8          | 2                      | 32.0             | 34.5              | 330             | Mortality                    | 1.007                         |
| DLO2-20-AC-97         | DLO2-GN-8          | 2                      | 32.6             | 35.6              | 320             | Mortality                    | 0.924                         |
| DLO2-20-AC-98         | DLO2-GN-8          | 2                      | 43.4             | 46.6              | 620             | -                            | 0.758                         |
| DLO2-20-AC-99         | DLO2-GN-8          | 3                      | 34.9             | 38.0              | 410             | -                            | 0.965                         |
| DLO2-20-AC-100        | DLO2-GN-8          | 3                      | 38.6             | 42.2              | 510             | -                            | 0.887                         |
| Overall Catch Summary | Sample Size (N)    |                        | 100              | 100               | 100             | -                            | 100                           |
|                       | Average            |                        | 36.0             | 38.9              | 449             | -                            | 0.923                         |
|                       | Median             |                        | 37.3             | 40.2              | 465             | -                            | 0.916                         |
|                       | Standard Deviation |                        | 4.6              | 5.0               | 149             | -                            | 0.096                         |
|                       | Standard Error     |                        | 0.46             | 0.50              | 14.9            | -                            | 0.010                         |
|                       | Minimum            |                        | 23.9             | 25.7              | 105             | -                            | 0.664                         |
|                       | Maximum            |                        | 44.4             | 48.0              | 720             | -                            | 1.290                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.24: Results of Littoral/Profundal Arctic Charr Health Endpoint Statistical Comparisons between 2020 Sheardown Lake SE (DLO-02) and 2020 Reference Lake 3 (REF) Data, and for Sheardown Lake SE between 2020 and the Mine Baseline Period (2006 to 2013), Mary River Project 2020 CREMP**

| Comparison                                      | Indicator             | Endpoint                      | Variables            |                       | Sample Size                 |             | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |                             |             | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|-------------------------------------------------|-----------------------|-------------------------------|----------------------|-----------------------|-----------------------------|-------------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|-----------------------------|-------------|--------------|--------------------------------------------|
|                                                 |                       |                               | Response             | Covariate             | REF 2020 or DLO-02 Baseline | DLO-02 2020 |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> | Statistic                       | REF 2020 or DLO-02 Baseline | DLO-02 2020 |              |                                            |
|                                                 |                       |                               |                      |                       |                             |             |        |                         |                      |                                              |                                 |                             |             |              |                                            |
| Sheardown Lake SE versus Reference Lake 3, 2020 | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 69                          | 100         | K-S    | -                       | -                    | -                                            | -                               | -                           | -           | <0.001       | -                                          |
|                                                 | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 69                          | 100         | M-W    | -                       | -                    | -                                            | Median                          | 30.9                        | 37.3        | <0.001       | 21                                         |
|                                                 |                       | Body Weight                   | Body Weight (g)      | -                     | 69                          | 100         | M-W    | -                       | -                    | -                                            | Median                          | 225                         | 465         | <0.001       | 107                                        |
|                                                 | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 69                          | 100         | ANCOVA | 0.258                   | <0.001               | 34.1                                         | Adjusted Mean                   | 317                         | 365         | <0.001       | 15                                         |
|                                                 |                       |                               |                      |                       | 68 <sup>e</sup>             | 100         | ANCOVA | 0.278                   | <0.001               | 34.2                                         | Adjusted Mean                   | 320                         | 366         | <0.001       | 14                                         |
| Sheardown Lake SE 2020 versus Baseline          | Survival              | Length Frequency Distribution | Fork Length (cm)     | -                     | 70                          | 100         | K-S    | -                       | -                    | -                                            | -                               | -                           | -           | 0.261        | -                                          |
|                                                 | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 70                          | 100         | M-W    | -                       | -                    | -                                            | Median                          | 37.4                        | 37.3        | 0.499        | -                                          |
|                                                 |                       | Body Weight                   | Body Weight (g)      | -                     | 70                          | 100         | M-W    | -                       | -                    | -                                            | Median                          | 500                         | 465         | 0.070        | -7.0                                       |
|                                                 | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 70                          | 100         | ANCOVA | 0.434                   | <0.001               | 35.9                                         | Adjusted Mean                   | 450                         | 425         | 0.001        | -5.6                                       |
|                                                 |                       |                               |                      |                       | 69 <sup>f</sup>             | 100         | ANCOVA | 0.702                   | <0.001               | 35.9                                         | Adjusted Mean                   | 446                         | 424         | 0.002        | -5.0                                       |

Area P-value < 0.1 or Interaction P-value < 0.05.

Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint).

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CRFDs was observed.

<sup>e</sup> One outlier (REF3-20-AC-03, Stdnt resid: -4.445) was removed from the analysis.

<sup>f</sup> One outlier (SLSE-08-AC-11, Stdnt resid: 4.136) was removed from the analysis.

**Table G.25: Arctic Charr Measurements from Fish Captured at Mary Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID   | Fork Length (cm) | Total Length (cm) | Total Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------|------------------|-------------------|------------------|-------------|-------------------------------|
| BLO-20-ACJ-01 | 8.1              | 8.6               | 4.703            | -           | 0.885                         |
| BLO-20-ACJ-02 | 7.8              | 8.2               | 3.991            | -           | 0.841                         |
| BLO-20-ACJ-03 | 8.5              | 9.0               | 5.246            | -           | 0.854                         |
| BLO-20-ACJ-04 | 8.2              | 8.8               | 4.157            | -           | 0.754                         |
| BLO-20-ACJ-05 | 10.7             | 11.5              | 10.313           | -           | 0.842                         |
| BLO-20-ACJ-06 | 8.1              | 8.6               | 4.265            | -           | 0.803                         |
| BLO-20-ACJ-07 | 8.0              | 8.6               | 5.007            | -           | 0.978                         |
| BLO-20-ACJ-08 | 8.2              | 8.7               | 4.769            | -           | 0.865                         |
| BLO-20-ACJ-09 | 10.3             | 11.1              | 8.912            | -           | 0.816                         |
| BLO-20-ACJ-10 | 6.8              | 7.2               | 2.764            | -           | 0.879                         |
| BLO-20-ACJ-11 | 7.3              | 7.7               | 3.020            | -           | 0.776                         |
| BLO-20-ACJ-12 | 8.9              | 9.5               | 6.097            | -           | 0.865                         |
| BLO-20-ACJ-13 | 6.8              | 7.2               | 2.572            | -           | 0.818                         |
| BLO-20-ACJ-14 | 8.9              | 9.5               | 7.231            | -           | 1.026                         |
| BLO-20-ACJ-15 | 10.2             | 11.0              | 9.647            | -           | 0.909                         |
| BLO-20-ACJ-16 | 8.5              | 9.1               | 5.621            | -           | 0.915                         |
| BLO-20-ACJ-17 | 7.3              | 7.7               | 3.018            | -           | 0.776                         |
| BLO-20-ACJ-18 | 7.7              | 8.2               | 3.623            | -           | 0.794                         |
| BLO-20-ACJ-19 | 8.0              | 8.6               | 3.974            | -           | 0.776                         |
| BLO-20-ACJ-20 | 7.9              | 8.5               | 4.098            | -           | 0.831                         |
| BLO-20-ACJ-21 | 7.7              | 8.2               | 3.944            | -           | 0.864                         |
| BLO-20-ACJ-22 | 7.2              | 7.7               | 3.130            | -           | 0.839                         |
| BLO-20-ACJ-23 | 7.1              | 7.4               | 2.698            | -           | 0.754                         |
| BLO-20-ACJ-24 | 8.4              | 8.9               | 4.702            | -           | 0.793                         |
| BLO-20-ACJ-25 | 8.0              | 8.6               | 5.178            | -           | 1.011                         |
| BLO-20-ACJ-26 | 9.8              | 10.6              | 8.826            | -           | 0.938                         |
| BLO-20-ACJ-27 | 7.9              | 8.5               | 4.180            | -           | 0.848                         |
| BLO-20-ACJ-28 | 6.9              | 7.3               | 2.527            | -           | 0.769                         |
| BLO-20-ACJ-29 | 6.7              | 7.1               | 2.273            | -           | 0.756                         |
| BLO-20-ACJ-30 | 7.4              | 7.9               | 4.242            | -           | 1.047                         |
| BLO-20-ACJ-31 | 8.5              | 9.1               | 5.161            | -           | 0.840                         |
| BLO-20-ACJ-32 | 6.3              | 6.7               | 1.964            | -           | 0.785                         |
| BLO-20-ACJ-33 | 6.9              | 7.4               | 2.621            | -           | 0.798                         |
| BLO-20-ACJ-34 | 8.0              | 8.5               | 4.266            | -           | 0.833                         |
| BLO-20-ACJ-35 | 7.6              | 8.1               | 3.556            | -           | 0.810                         |
| BLO-20-ACJ-36 | 7.4              | 7.8               | 3.378            | -           | 0.834                         |
| BLO-20-ACJ-37 | 8.4              | 8.9               | 5.096            | -           | 0.860                         |
| BLO-20-ACJ-38 | 7.7              | 8.2               | 3.790            | -           | 0.830                         |
| BLO-20-ACJ-39 | 6.6              | 7.0               | 2.347            | -           | 0.816                         |
| BLO-20-ACJ-40 | 7.3              | 7.8               | 3.230            | -           | 0.830                         |
| BLO-20-ACJ-41 | 7.2              | 7.7               | 3.123            | -           | 0.837                         |
| BLO-20-ACJ-42 | 6.3              | 6.7               | 2.091            | -           | 0.836                         |
| BLO-20-ACJ-43 | 6.7              | 7.2               | 2.279            | -           | 0.758                         |
| BLO-20-ACJ-44 | 8.5              | 9.0               | 5.091            | -           | 0.829                         |
| BLO-20-ACJ-45 | 6.8              | 7.2               | 2.745            | -           | 0.873                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.25: Arctic Charr Measurements from Fish Captured at Mary Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID   | Fork Length (cm) | Total Length (cm) | Total Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------|------------------|-------------------|------------------|-------------|-------------------------------|
| BLO-20-ACJ-46 | 7.9              | 8.4               | 3.808            | -           | 0.772                         |
| BLO-20-ACJ-47 | 8.2              | 8.7               | 4.932            | -           | 0.895                         |
| BLO-20-ACJ-48 | 6.1              | 6.4               | 1.737            | -           | 0.765                         |
| BLO-20-ACJ-49 | 6.3              | 6.7               | 2.586            | -           | 1.034                         |
| BLO-20-ACJ-50 | 8.2              | 8.8               | 4.451            | -           | 0.807                         |
| BLO-20-ACJ-51 | 8.8              | 9.5               | 5.333            | -           | 0.783                         |
| BLO-20-ACJ-52 | 6.4              | 6.7               | 1.911            | -           | 0.729                         |
| BLO-20-ACJ-53 | 7.4              | 7.9               | 3.259            | -           | 0.804                         |
| BLO-20-ACJ-54 | 9.2              | 9.8               | 5.922            | 2           | 0.761                         |
| BLO-20-ACJ-55 | 7.2              | 7.6               | 3.232            | 1           | 0.866                         |
| BLO-20-ACJ-56 | 9.8              | 10.5              | 8.010            | 2           | 0.851                         |
| BLO-20-ACJ-57 | 4.1              | 4.2               | 0.503            | 0           | 0.730                         |
| BLO-20-ACJ-58 | 7.7              | 8.1               | 3.477            | 1           | 0.762                         |
| BLO-20-ACJ-59 | 8.5              | 9.1               | 5.057            | 1           | 0.823                         |
| BLO-20-ACJ-60 | 7.4              | 7.9               | 3.588            | 1           | 0.885                         |
| BLO-20-ACJ-61 | 6.3              | 6.7               | 1.975            | 1           | 0.790                         |
| BLO-20-ACJ-62 | 12.8             | 13.9              | 23.332           | 3           | 1.113                         |
| BLO-20-ACJ-63 | 12.0             | 13.0              | 15.624           | 4           | 0.904                         |
| BLO-20-ACJ-64 | 8.5              | 9.1               | 5.002            | -           | 0.814                         |
| BLO-20-ACJ-65 | 6.6              | 7.0               | 2.441            | -           | 0.849                         |
| BLO-20-ACJ-66 | 8.4              | 9.0               | 5.394            | -           | 0.910                         |
| BLO-20-ACJ-67 | 9.1              | 9.8               | 6.730            | -           | 0.893                         |
| BLO-20-ACJ-68 | 7.0              | 7.4               | 2.540            | -           | 0.741                         |
| BLO-20-ACJ-69 | 6.5              | 6.9               | 2.852            | -           | 1.039                         |
| BLO-20-ACJ-70 | 10.1             | 11.0              | 8.975            | -           | 0.871                         |
| BLO-20-ACJ-71 | 9.3              | 9.9               | 6.306            | -           | 0.784                         |
| BLO-20-ACJ-72 | 7.6              | 8.1               | 3.335            | -           | 0.760                         |
| BLO-20-ACJ-73 | 10.6             | 11.4              | 11.564           | -           | 0.971                         |
| BLO-20-ACJ-74 | 10.6             | 11.4              | 9.466            | -           | 0.795                         |
| BLO-20-ACJ-75 | 7.5              | 8.0               | 3.579            | -           | 0.848                         |
| BLO-20-ACJ-76 | 10.4             | 11.2              | 9.650            | -           | 0.858                         |
| BLO-20-ACJ-77 | 12.0             | 13.0              | 17.642           | -           | 1.021                         |
| BLO-20-ACJ-78 | 5.9              | 6.7               | 1.784            | -           | 0.869                         |
| BLO-20-ACJ-79 | 6.3              | 6.7               | 1.955            | -           | 0.782                         |
| BLO-20-ACJ-80 | 6.8              | 7.2               | 2.455            | -           | 0.781                         |
| BLO-20-ACJ-81 | 7.2              | 7.7               | 3.094            | -           | 0.829                         |
| BLO-20-ACJ-82 | 6.9              | 7.4               | 2.870            | -           | 0.874                         |
| BLO-20-ACJ-83 | 7.4              | 7.8               | 3.481            | -           | 0.859                         |
| BLO-20-ACJ-84 | 6.5              | 6.9               | 2.361            | -           | 0.860                         |
| BLO-20-ACJ-85 | 5.8              | 6.2               | 1.559            | -           | 0.799                         |
| BLO-20-ACJ-86 | 7.3              | 7.8               | 3.379            | -           | 0.869                         |
| BLO-20-ACJ-87 | 11.4             | 12.4              | 15.115           | -           | 1.020                         |
| BLO-20-ACJ-88 | 7.1              | 7.5               | 2.942            | -           | 0.822                         |
| BLO-20-ACJ-89 | 8.3              | 8.8               | 5.198            | -           | 0.909                         |
| BLO-20-ACJ-90 | 8.5              | 9.1               | 4.962            | -           | 0.808                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.25: Arctic Charr Measurements from Fish Captured at Mary Lake by Electrofishing, Mary River Project CREMP, August 2020**

| Specimen ID                     |                    | Fork Length (cm) | Total Length (cm) | Total Weight (g) | Age (years) | Fulton's Condition Factor (K) |
|---------------------------------|--------------------|------------------|-------------------|------------------|-------------|-------------------------------|
| BLO-20-ACJ-91                   |                    | 5.9              | 6.2               | 1.765            | -           | 0.859                         |
| BLO-20-ACJ-92                   |                    | 8.8              | 9.4               | 5.579            | -           | 0.819                         |
| BLO-20-ACJ-93                   |                    | 4.1              | 4.2               | 0.546            | -           | 0.792                         |
| BLO-20-ACJ-94                   |                    | 6.2              | 6.5               | 1.882            | -           | 0.790                         |
| BLO-20-ACJ-95                   |                    | 6.6              | 6.9               | 2.257            | -           | 0.785                         |
| BLO-20-ACJ-96                   |                    | 6.2              | 6.6               | 2.257            | -           | 0.947                         |
| BLO-20-ACJ-97                   |                    | 7.1              | 7.6               | 3.349            | -           | 0.936                         |
| BLO-20-ACJ-98                   |                    | 7.6              | 8.1               | 3.704            | -           | 0.844                         |
| BLO-20-ACJ-99                   |                    | 7.0              | 7.5               | 3.040            | -           | 0.886                         |
| BLO-20-ACJ-100                  |                    | 7.3              | 7.8               | 3.212            | -           | 0.826                         |
| Overall Catch Summary           | Sample Size (N)    | 100              | 100               | 100              | 10          | 100                           |
|                                 | Average            | 7.8              | 8.4               | 4.684            | 1.6         | 0.848                         |
|                                 | Median             | 7.6              | 8.1               | 3.606            | 1.0         | 0.835                         |
|                                 | Standard Deviation | 1.5              | 1.7               | 3.521            | 1.2         | 0.077                         |
|                                 | Standard Error     | 0.15             | 0.17              | 0.352            | 0.37        | 0.008                         |
|                                 | Minimum            | 4.1              | 4.2               | 0.503            | 0.0         | 0.729                         |
|                                 | Maximum            | 12.8             | 13.9              | 23.332           | 4.0         | 1.113                         |
| Young-of-the-Year Catch Summary | proportion of YOY  | 2%               |                   |                  |             |                               |
|                                 | Sample Size (N)    | 2                | 2                 | 2                | 1           | 2                             |
|                                 | Average            | 4.1              | 4.2               | 0.525            | 0           | 0.761                         |
|                                 | Median             | 4.1              | 4.2               | 0.525            | 0           | 0.761                         |
|                                 | Standard Deviation | 0.0              | 0.0               | 0.030            | 0           | 0.044                         |
|                                 | Standard Error     | 0.0              | 0.0               | 0.022            | 0           | 0.031                         |
|                                 | Minimum            | 4.1              | 4.2               | 0.503            | 0           | 0.730                         |
|                                 | Maximum            | 4.1              | 4.2               | 0.546            | 0           | 0.792                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.26: Results of Nearshore Arctic Charr Non-Young-of-the-Year (YOY) Health Endpoint Statistical Comparisons between Mary Lake (BLO) and Reference Lake 3 (REF), Mary River Project CREMP, August 2020**

| Group    | Indicator                | Endpoint                      | Variables        |                      | Sample Size           |     | Test | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |               |      | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|----------|--------------------------|-------------------------------|------------------|----------------------|-----------------------|-----|------|-------------------------|----------------------|----------------------------------------------|---------------------------------|---------------|------|--------------|--------------------------------------------|
|          |                          |                               | Response         | Covariate            | REF                   | BLO |      | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |               |      |              |                                            |
|          |                          |                               |                  |                      |                       |     |      | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF           | BLO  |              |                                            |
| All Fish | Recruitment/<br>Survival | Length Frequency Distribution | Fork Length (cm) | -                    | 100                   | 100 | K-S  | -                       | -                    | -                                            | -                               | -             | -    | 0.001        | -                                          |
| Non-YOY  | Survival                 | Length Frequency Distribution | Fork Length (cm) | -                    | 79                    | 98  | K-S  | -                       | -                    | -                                            | -                               | -             | -    | 0.761        | -                                          |
|          | Body Size                | Fork Length                   | Fork Length (cm) | -                    | 79                    | 98  | M-W  | -                       | -                    | -                                            | Median                          | 7.70          | 7.65 | 0.712        | -                                          |
|          |                          | Body Weight                   | Body Weight (g)  | -                    | 79                    | 98  | M-W  | -                       | -                    | -                                            | Median                          | 3.55          | 3.66 | 0.555        | -                                          |
|          |                          | Energy Storage                | Condition        | log[Body Weight (g)] | log[Fork Length (cm)] | 79  | 98   | ANCOVA                  | 0.005 <sup>e</sup>   | <0.001                                       | 7.78                            | Adjusted Mean | 3.89 | 3.99         | 0.034                                      |

Area P-value < 0.1 or Interaction P-value < 0.05

Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CRFDs was observed.

<sup>e</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9838 and R2 of parallel slope model = 0.9831; a difference < 0.02) following Environment Canada (2012).



**Table G.27: Arctic Charr Estimated Sample Sizes to Detect Various Effect Sizes as a Percentage Change in Respective Fish Health Endpoints at Mary Lake (BLO) Using 2020 Data Relative to Reference Lake 3 Data (2020) or Mary Lake Baseline Data (2006 to 2013) with  $\alpha=\beta=0.1$ , Mary River Project 2020 CREMP**

| Comparison                                                                   | Group    | Indicator      | Endpoint               | Variables                     |                       | Test <sup>a</sup> | S <sup>b</sup> | COV (%) <sup>c</sup> | Minimum Sample Size to Detect an Effect Size (% Increase/Decrease Relative to Reference) with α=β=0.1 |          |     |      |      |      |      |      |      |      |       |
|------------------------------------------------------------------------------|----------|----------------|------------------------|-------------------------------|-----------------------|-------------------|----------------|----------------------|-------------------------------------------------------------------------------------------------------|----------|-----|------|------|------|------|------|------|------|-------|
|                                                                              |          |                |                        | Response                      | Covariate             |                   |                |                      | log(Response)                                                                                         | 5%       | 10% | 20%  | 25%  | 30%  | 33%  | 40%  | 50%  | 100% |       |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | -5%      | -9% | -17% | -20% | -23% | -25% | -29% | -33% | -50% |       |
|                                                                              |          |                |                        |                               |                       |                   |                |                      |                                                                                                       | Response | ±5% | ±10% | ±20% | ±25% | ±30% | ±33% | ±40% | ±50% | ±100% |
| Nearshore Arctic Charr (Electrofishing) versus Ref. Lake 3, 2020 Data        | Non-YOY  | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0854         | 21.9                 | Response                                                                                              | 323      | 86  | 25   | 17   | 12   | 11   | 7    | 6    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.265          | 99.1                 | Response                                                                                              | 3,095    | 813 | 224  | 150  | 109  | 91   | 66   | 47   | 17   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0346         | -                    | log(Response)                                                                                         | 48       | 14  | 6    | 5    | 4    | 4    | 4    | 3    | 3    |       |
| Littoral/Profundal Arctic Charr (Gill Netting) versus Ref. Lake 3, 2020 Data | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0901         | 24.7                 | Response                                                                                              | 360      | 95  | 27   | 19   | 14   | 12   | 10   | 7    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.274          | 115                  | Response                                                                                              | 3,316    | 871 | 239  | 160  | 116  | 98   | 71   | 50   | 18   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0465         | -                    | log(Response)                                                                                         | 85       | 24  | 8    | 6    | 5    | 5    | 4    | 4    | 3    |       |
|                                                                              |          |                | Condition <sup>d</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0437         | -                    | log(Response)                                                                                         | 75       | 21  | 8    | 6    | 5    | 5    | 4    | 4    | 3    |       |
| Littoral/Profundal Arctic Charr (Gill Netting) 2020 versus Baseline          | All fish | Body Size      | Fork Length            | Fork Length (cm)              | -                     | M-W               | 0.0973         | 21.5                 | Response                                                                                              | 369      | 93  | 25   | 17   | 12   | 10   | 7    | 6    | 4    |       |
|                                                                              |          |                | Body Weight            | Body Weight (g)               | -                     | M-W               | 0.28           | 77.0                 | Response                                                                                              | 3,461    | 909 | 249  | 167  | 122  | 101  | 75   | 49   | 13   |       |
|                                                                              |          | Energy Storage | Condition              | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0563         | -                    | log(Response)                                                                                         | 123      | 34  | 11   | 8    | 7    | 6    | 5    | 4    | 3    |       |
|                                                                              |          |                | Condition <sup>e</sup> | log[Adjusted Body Weight (g)] | log[Fork Length (cm)] | ANCOVA            | 0.0547         | -                    | log(Response)                                                                                         | 117      | 32  | 10   | 8    | 6    | 6    | 5    | 4    | 3    |       |

<sup>a</sup> Sample size estimates for the M-W test were estimated based for a two-sample t-test using sample sizes multiplied by 0.864. The 0.864 is the lower bound of the asymptotic relative efficiency of the Mann-Whitney test and the two-sample t-test (Hodges and Lehmann 1956). Estimates were generated for the response variable on the untransformed and log<sub>10</sub>-transformed scales and the lowest sample size is reported.

<sup>b</sup> Pooled standard deviation of the regression residuals

<sup>c</sup> Coefficient of variation (pooled standard deviation/reference mean)×100%

<sup>d</sup> One outlier (REF3-20-AC-03, Stdnt resid: -4.722) was removed from the analysis.

<sup>e</sup> One outlier (MLS-06-AC-11, Stdnt resid: 4.102) was removed from analysis.



**Table G.28: Gill Netting Catch Records for Mary Lake, Mary River Project CREMP, August 2020**

| Gill Net Set ID | Location (NAD83, UTM Zone 17W) |          | Length (m) | Set Date  | Lift Date | Set Time | Lift Time | Fishing Hours | Effort (m*hrs/100 m) | Arctic Charr Catch per Mesh Size |           |           | Total Catch | CPUE        |
|-----------------|--------------------------------|----------|------------|-----------|-----------|----------|-----------|---------------|----------------------|----------------------------------|-----------|-----------|-------------|-------------|
|                 | Easting                        | Northing |            |           |           |          |           |               |                      | 1½"                              | 2"        | 3"        |             |             |
| BLO-20-GN-1     | 555150                         | 7905810  | 91.4       | 15-Aug-20 | 15-Aug-20 | 15:06    | 15:53     | 0.783         | 0.716                | 1                                | 0         | 0         | 1           | 1.40        |
| BLO-20-GN-2     | 554964                         | 7906049  | 91.4       | 15-Aug-20 | 15-Aug-20 | 15:13    | 16:02     | 0.817         | 0.747                | 1                                | 1         | 2         | 4           | 5.36        |
| BLO-20-GN-3A    | 554852                         | 7906039  | 91.4       | 15-Aug-20 | 15-Aug-20 | 15:18    | 16:25     | 1.12          | 1.02                 | 1                                | 3         | 4         | 8           | 7.83        |
| BLO-20-GN-3B    | 554852                         | 7906039  | 91.4       | 15-Aug-20 | 15-Aug-20 | 16:55    | 17:35     | 0.667         | 0.610                | 1                                | 2         | 0         | 3           | 4.92        |
| BLO-20-GN-4     | 554852                         | 7905955  | 91.4       | 15-Aug-20 | 15-Aug-20 | 16:25    | 17:14     | 0.817         | 0.746                | 0                                | 2         | 4         | 6           | 8.04        |
| BLO-20-GN-5     | 554800                         | 7906071  | 91.4       | 15-Aug-20 | 15-Aug-20 | 17:00    | 17:47     | 0.783         | 0.716                | 2                                | 2         | 1         | 5           | 6.98        |
| BLO-20-GN-6A    | 554536                         | 7906390  | 91.4       | 16-Aug-20 | 16-Aug-20 | 8:52     | 9:47      | 0.917         | 0.838                | 2                                | 4         | 4         | 10          | 11.9        |
| BLO-20-GN-6B    | 554536                         | 7906390  | 91.4       | 16-Aug-20 | 16-Aug-20 | 10:30    | 11:48     | 1.30          | 1.19                 | 0                                | 3         | 2         | 5           | 4.21        |
| BLO-20-GN-6C    | 554536                         | 7906390  | 91.4       | 16-Aug-20 | 16-Aug-20 | 12:23    | 13:36     | 1.22          | 1.11                 | 0                                | 1         | 1         | 2           | 1.80        |
| BLO-20-GN-6D    | 554536                         | 7906390  | 91.4       | 16-Aug-20 | 16-Aug-20 | 13:52    | 15:11     | 1.32          | 1.20                 | 0                                | 1         | 2         | 3           | 2.49        |
| BLO-20-GN-7A    | 554639                         | 7906204  | 91.4       | 16-Aug-20 | 16-Aug-20 | 9:02     | 10:32     | 1.50          | 1.37                 | 1                                | 2         | 4         | 7           | 5.11        |
| BLO-20-GN-7B    | 554639                         | 7906204  | 91.4       | 16-Aug-20 | 16-Aug-20 | 11:10    | 12:26     | 1.27          | 1.16                 | 0                                | 2         | 1         | 3           | 2.59        |
| BLO-20-GN-7C    | 554639                         | 7906204  | 91.4       | 16-Aug-20 | 16-Aug-20 | 12:43    | 13:54     | 1.18          | 1.08                 | 0                                | 3         | 1         | 4           | 3.70        |
| BLO-20-GN-7D    | 554639                         | 7906204  | 91.4       | 16-Aug-20 | 16-Aug-20 | 14:13    | 15:33     | 1.33          | 1.22                 | 2                                | 0         | 1         | 3           | 2.46        |
| BLO-20-GN-8A    | 554834                         | 7906040  | 91.4       | 16-Aug-20 | 16-Aug-20 | 9:11     | 11:13     | 2.03          | 1.86                 | 0                                | 4         | 4         | 8           | 4.30        |
| BLO-20-GN-8B    | 554834                         | 7906040  | 91.4       | 16-Aug-20 | 16-Aug-20 | 11:44    | 12:46     | 1.03          | 0.944                | 1                                | 1         | 1         | 3           | 3.18        |
| BLO-20-GN-8C    | 554834                         | 7906040  | 91.4       | 16-Aug-20 | 16-Aug-20 | 13:08    | 14:18     | 1.17          | 1.07                 | 0                                | 2         | 1         | 3           | 2.81        |
| BLO-20-GN-8D    | 554834                         | 7906040  | 91.4       | 16-Aug-20 | 16-Aug-20 | 14:33    | 16:07     | 1.57          | 1.43                 | 1                                | 2         | 2         | 5           | 3.49        |
| BLO-20-GN-9A    | 554926                         | 7906000  | 91.4       | 16-Aug-20 | 16-Aug-20 | 13:30    | 14:43     | 1.22          | 1.11                 | 1                                | 4         | 1         | 6           | 5.40        |
| BLO-20-GN-9B    | 554926                         | 7906000  | 91.4       | 16-Aug-20 | 16-Aug-20 | 15:03    | 16:27     | 1.40          | 1.28                 | 0                                | 2         | 3         | 5           | 3.91        |
| <b>Total</b>    |                                |          |            |           |           |          |           |               | <b>21.4</b>          | <b>14</b>                        | <b>41</b> | <b>39</b> | <b>94</b>   | <b>4.60</b> |

Note: Catch-per-unit-effort (CPUE) represents the number of fish captured per 100 m-hours of net.

**Table G.29: Arctic Charr Measurements from Fish Captured at Mary Lake by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID  | Net ID    | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities  | Fulton's Condition Factor (K) |
|--------------|-----------|------------------------|------------------|-------------------|-----------------|----------------|-------------------------------|
| BLO-20-AC-01 | BLO-GN-1  | 1½                     | 38.5             | 41.8              | 545             | -              | 0.955                         |
| BLO-20-AC-02 | BLO-GN-2  | 3                      | 38.9             | 42.5              | 495             | -              | 0.841                         |
| BLO-20-AC-03 | BLO-GN-2  | 3                      | 41.0             | 45.2              | 590             | -              | 0.856                         |
| BLO-20-AC-04 | BLO-GN-2  | 2                      | 39.3             | 42.2              | 500             | -              | 0.824                         |
| BLO-20-AC-05 | BLO-GN-2  | 1½                     | 36.6             | 40.2              | 480             | -              | 0.979                         |
| BLO-20-AC-06 | BLO-GN-3A | 3                      | 37.0             | 40.6              | 435             | -              | 0.859                         |
| BLO-20-AC-07 | BLO-GN-3A | 3                      | 38.6             | 41.9              | 560             | -              | 0.974                         |
| BLO-20-AC-08 | BLO-GN-3A | 3                      | 38.9             | 42.2              | 585             | -              | 0.994                         |
| BLO-20-AC-09 | BLO-GN-3A | 3                      | 36.7             | 39.9              | 465             | -              | 0.941                         |
| BLO-20-AC-10 | BLO-GN-3A | 2                      | 39.6             | 43.1              | 600             | -              | 0.966                         |
| BLO-20-AC-11 | BLO-GN-3A | 2                      | 38.3             | 41.4              | 495             | -              | 0.881                         |
| BLO-20-AC-12 | BLO-GN-3A | 2                      | 37.9             | 40.5              | 520             | -              | 0.955                         |
| BLO-20-AC-13 | BLO-GN-3A | 1½                     | 41.2             | 44.8              | 540             | -              | 0.772                         |
| BLO-20-AC-14 | BLO-GN-4  | 3                      | 36.5             | 39.9              | 455             | -              | 0.936                         |
| BLO-20-AC-15 | BLO-GN-4  | 3                      | 40.3             | 43.5              | 585             | -              | 0.894                         |
| BLO-20-AC-16 | BLO-GN-4  | 3                      | 37.4             | 41.0              | 490             | -              | 0.937                         |
| BLO-20-AC-17 | BLO-GN-4  | 3                      | 38.0             | 41.0              | 520             | -              | 0.948                         |
| BLO-20-AC-18 | BLO-GN-4  | 2                      | 37.9             | 40.8              | 460             | Mortality      | 0.845                         |
| BLO-20-AC-19 | BLO-GN-4  | 2                      | 33.2             | 35.3              | 370             | -              | 1.011                         |
| BLO-20-AC-20 | BLO-GN-3B | 2                      | 45.1             | 48.1              | 920             | -              | 1.003                         |
| BLO-20-AC-21 | BLO-GN-3B | 2                      | 33.6             | 36.5              | 400             | -              | 1.054                         |
| BLO-20-AC-22 | BLO-GN-3B | 1½                     | 33.8             | 36.5              | 330             | -              | 0.855                         |
| BLO-20-AC-23 | BLO-GN-5  | 3                      | 41.9             | 45.3              | 550             | -              | 0.748                         |
| BLO-20-AC-24 | BLO-GN-5  | 2                      | 39.2             | 43.1              | 450             | -              | 0.747                         |
| BLO-20-AC-25 | BLO-GN-5  | 2                      | 40.5             | 43.5              | 605             | -              | 0.911                         |
| BLO-20-AC-26 | BLO-GN-5  | 1½                     | 23.8             | 25.9              | 115             | Mortality      | 0.853                         |
| BLO-20-AC-27 | BLO-GN-5  | 1½                     | 31.9             | 34.8              | 295             | -              | 0.909                         |
| BLO-20-AC-28 | BLO-GN-6A | 1½                     | 18.1             | 19.5              | 60              | -              | 1.012                         |
| BLO-20-AC-29 | BLO-GN-6A | 1½                     | 31.3             | 34.0              | 255             | Mortality      | 0.832                         |
| BLO-20-AC-30 | BLO-GN-6A | 2                      | 39.6             | 43.1              | 595             | -              | 0.958                         |
| BLO-20-AC-31 | BLO-GN-6A | 2                      | 37.6             | 41.0              | 565             | Mortality      | 1.063                         |
| BLO-20-AC-32 | BLO-GN-6A | 2                      | 36.4             | 39.2              | 460             | Mortality      | 0.954                         |
| BLO-20-AC-33 | BLO-GN-6A | 3                      | 38.1             | 42.0              | 510             | -              | 0.922                         |
| BLO-20-AC-34 | BLO-GN-6A | 2                      | 36.9             | 40.1              | 420             | -              | 0.836                         |
| BLO-20-AC-35 | BLO-GN-6A | 3                      | 36.1             | 39.3              | 400             | -              | 0.850                         |
| BLO-20-AC-36 | BLO-GN-6A | 3                      | 36.5             | 40.1              | 560             | -              | 1.152                         |
| BLO-20-AC-37 | BLO-GN-6A | 3                      | 37.0             | 39.8              | 480             | -              | 0.948                         |
| BLO-20-AC-38 | BLO-GN-7A | 3                      | 38.9             | 42.3              | 530             | -              | 0.900                         |
| BLO-20-AC-39 | BLO-GN-7A | 3                      | 36.0             | 39.0              | 450             | -              | 0.965                         |
| BLO-20-AC-40 | BLO-GN-7A | 3                      | 39.5             | 43.4              | 490             | -              | 0.795                         |
| BLO-20-AC-41 | BLO-GN-7A | 3                      | 38.8             | 41.7              | 510             | -              | 0.873                         |
| BLO-20-AC-42 | BLO-GN-7A | 2                      | 38.9             | 42.2              | 460             | -              | 0.781                         |
| BLO-20-AC-43 | BLO-GN-7A | 2                      | 65.3             | 68.8              | 2,525           | -              | 0.907                         |
| BLO-20-AC-44 | BLO-GN-7A | 1½                     | 40.6             | 44.2              | 580             | -              | 0.867                         |
| BLO-20-AC-45 | BLO-GN-8A | 3                      | 39.9             | 43.6              | 520             | -              | 0.819                         |
| BLO-20-AC-46 | BLO-GN-8A | 3                      | 36.6             | 39.9              | 465             | -              | 0.948                         |
| BLO-20-AC-47 | BLO-GN-8A | 3                      | 64.0             | 67.5              | 2,150           | Gill parasites | 0.820                         |
| BLO-20-AC-48 | BLO-GN-8A | 3                      | 38.5             | 41.6              | 510             | -              | 0.894                         |
| BLO-20-AC-49 | BLO-GN-8A | 2                      | 38.8             | 41.8              | 495             | -              | 0.847                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.29: Arctic Charr Measurements from Fish Captured at Mary Lake by Gill Netting, Mary River Project CREMP, August 2020**

| Specimen ID                  | Net ID             | Net Mesh Size (inches) | Fork Length (cm) | Total Length (cm) | Body Weight (g) | Abnormalities | Fulton's Condition Factor (K) |
|------------------------------|--------------------|------------------------|------------------|-------------------|-----------------|---------------|-------------------------------|
| BLO-20-AC-50                 | BLO-GN-8A          | 2                      | 31.9             | 34.5              | 295             | Mortality     | 0.909                         |
| BLO-20-AC-51                 | BLO-GN-8A          | 2                      | 35.2             | 37.7              | 420             | Mortality     | 0.963                         |
| BLO-20-AC-52                 | BLO-GN-8A          | 2                      | 40.5             | 44.2              | 580             | Mortality     | 0.873                         |
| BLO-20-AC-53                 | BLO-GN-6B          | 3                      | 36.7             | 39.0              | 460             | -             | 0.931                         |
| BLO-20-AC-54                 | BLO-GN-6B          | 3                      | 36.9             | 39.9              | 490             | -             | 0.975                         |
| BLO-20-AC-55                 | BLO-GN-6B          | 2                      | 35.5             | 38.4              | 430             | Mortality     | 0.961                         |
| BLO-20-AC-56                 | BLO-GN-6B          | 2                      | 34.9             | 37.7              | 405             | Mortality     | 0.953                         |
| BLO-20-AC-57                 | BLO-GN-6B          | 2                      | 36.1             | 39.0              | 415             | Mortality     | 0.882                         |
| BLO-20-AC-58                 | BLO-GN-7B          | 3                      | 37.9             | 41.1              | 495             | -             | 0.909                         |
| BLO-20-AC-59                 | BLO-GN-7B          | 2                      | 33.4             | 36.1              | 370             | -             | 0.993                         |
| BLO-20-AC-60                 | BLO-GN-7B          | 2                      | 35.6             | 38.4              | 445             | -             | 0.986                         |
| BLO-20-AC-61                 | BLO-GN-8B          | 3                      | 37.9             | 41.4              | 530             | -             | 0.974                         |
| BLO-20-AC-62                 | BLO-GN-8B          | 2                      | 32.9             | 35.7              | 345             | -             | 0.969                         |
| BLO-20-AC-63                 | BLO-GN-8B          | 1½                     | 46.8             | 49.9              | 910             | -             | 0.888                         |
| BLO-20-AC-64                 | BLO-GN-6C          | 3                      | 37.4             | 40.4              | 515             | -             | 0.984                         |
| BLO-20-AC-65                 | BLO-GN-6C          | 2                      | 37.1             | 39.7              | 420             | Mortality     | 0.822                         |
| BLO-20-AC-66                 | BLO-GN-7C          | 3                      | 38.6             | 41.4              | 495             | -             | 0.861                         |
| BLO-20-AC-67                 | BLO-GN-7C          | 2                      | 37.9             | 41.0              | 440             | -             | 0.808                         |
| BLO-20-AC-68                 | BLO-GN-7C          | 2                      | 28.4             | 31.0              | 212             | -             | 0.926                         |
| BLO-20-AC-69                 | BLO-GN-7C          | 2                      | 32.5             | 35.7              | 320             | Mortality     | 0.932                         |
| BLO-20-AC-70                 | BLO-GN-8C          | 3                      | 67.5             | 71.6              | 2,550           | -             | 0.829                         |
| BLO-20-AC-71                 | BLO-GN-8C          | 2                      | 38.2             | 41.5              | 360             | -             | 0.646                         |
| BLO-20-AC-72                 | BLO-GN-8C          | 2                      | 64.5             | 69.3              | 2,325           | -             | 0.866                         |
| BLO-20-AC-73                 | BLO-GN-9A          | 2                      | 32.8             | 35.4              | 355             | -             | 1.006                         |
| BLO-20-AC-74                 | BLO-GN-9A          | 3                      | 39.9             | 43.1              | 485             | -             | 0.764                         |
| BLO-20-AC-75                 | BLO-GN-9A          | 2                      | 34.0             | 36.9              | 380             | Mortality     | 0.967                         |
| BLO-20-AC-76                 | BLO-GN-9A          | 2                      | 39.9             | 42.9              | 565             | -             | 0.889                         |
| BLO-20-AC-77                 | BLO-GN-9A          | 2                      | 37.7             | 40.6              | 510             | -             | 0.952                         |
| BLO-20-AC-78                 | BLO-GN-9A          | 1½                     | 34.1             | 36.8              | 373             | -             | 0.941                         |
| BLO-20-AC-79                 | BLO-GN-6D          | 3                      | 40.9             | 44.0              | 573             | -             | 0.837                         |
| BLO-20-AC-80                 | BLO-GN-6D          | 3                      | 39.6             | 43.1              | 555             | -             | 0.894                         |
| BLO-20-AC-81                 | BLO-GN-6D          | 2                      | 61.1             | 65.4              | 2,100           | Mortality     | 0.921                         |
| BLO-20-AC-82                 | BLO-GN-7D          | 3                      | 37.0             | 39.9              | 505             | -             | 0.997                         |
| BLO-20-AC-83                 | BLO-GN-7D          | 1½                     | 33.4             | 36.3              | 365             | Mortality     | 0.980                         |
| BLO-20-AC-84                 | BLO-GN-7D          | 1½                     | 33.6             | 35.9              | 475             | -             | 1.252                         |
| BLO-20-AC-85                 | BLO-GN-8D          | 3                      | 38.4             | 41.5              | 560             | -             | 0.989                         |
| BLO-20-AC-86                 | BLO-GN-8D          | 3                      | 39.1             | 42.2              | 520             | -             | 0.870                         |
| BLO-20-AC-87                 | BLO-GN-8D          | 2                      | 36.7             | 39.9              | 485             | Mortality     | 0.981                         |
| BLO-20-AC-88                 | BLO-GN-8D          | 2                      | 35.9             | 38.8              | 360             | -             | 0.778                         |
| BLO-20-AC-89                 | BLO-GN-8D          | 1½                     | 36.7             | 39.3              | 455             | -             | 0.920                         |
| BLO-20-AC-90                 | BLO-GN-9B          | 3                      | 38.3             | 41.1              | 540             | -             | 0.961                         |
| BLO-20-AC-91                 | BLO-GN-9B          | 3                      | 39.9             | 43.4              | 495             | -             | 0.779                         |
| BLO-20-AC-92                 | BLO-GN-9B          | 3                      | 37.1             | 40.1              | 480             | -             | 0.940                         |
| BLO-20-AC-93                 | BLO-GN-9B          | 2                      | 40.0             | 43.1              | 595             | -             | 0.930                         |
| BLO-20-AC-94                 | BLO-GN-9B          | 2                      | 36.2             | 38.6              | 425             | Mortality     | 0.896                         |
| <b>Overall Catch Summary</b> | Sample Size (N)    |                        | 94               | 94                | 94              | -             | 94                            |
|                              | Average            |                        | 38.5             | 41.6              | 572             | -             | 0.911                         |
|                              | Median             |                        | 37.9             | 41.0              | 490             | -             | 0.921                         |
|                              | Standard Deviation |                        | 7.2              | 7.6               | 437             | -             | 0.087                         |
|                              | Standard Error     |                        | 0.75             | 0.78              | 45              | -             | 0.009                         |
|                              | Minimum            |                        | 18.1             | 19.5              | 60              | -             | 0.646                         |
|                              | Maximum            |                        | 67.5             | 71.6              | 2,550           | -             | 1.252                         |

Note: "-" indicates measurement not taken or no comment.

**Table G.30: Results of Littoral/Profundal Arctic Charr Health Endpoint Statistical Comparisons between 2020 Mary Lake (BLO) and 2020 Reference Lake 3 (REF) Data, and for Camp Lake between 2020 and the Mine Baseline Period (2005 to 2013), Mary River Project 2020 CREMP**

| Comparison                              | Indicator             | Endpoint                      | Variables            |                       | Sample Size          |          | Test   | ANCOVA Model Statistics |                      |                                              | Summary Statistics <sup>b</sup> |                      |          | Test P-value | Magnitude of Difference (%) <sup>c,d</sup> |
|-----------------------------------------|-----------------------|-------------------------------|----------------------|-----------------------|----------------------|----------|--------|-------------------------|----------------------|----------------------------------------------|---------------------------------|----------------------|----------|--------------|--------------------------------------------|
|                                         |                       |                               | Response             | Covariate             | REF 2020 or BLO Base | BLO 2020 |        | Interaction Model       | Parallel Slope Model | Covariate Value for Comparisons <sup>a</sup> |                                 |                      |          |              |                                            |
|                                         |                       |                               |                      |                       |                      |          |        | Interaction P-value     | Covariate P-value    |                                              | Statistic                       | REF 2020 or BLO Base | BLO 2020 |              |                                            |
| Camp Lake versus Reference Lake 3, 2020 | Recruitment/ Survival | Length Frequency Distribution | Fork Length (cm)     | -                     | 69                   | 94       | K-S    | -                       | -                    | -                                            | -                               | -                    | -        | <0.001       | -                                          |
|                                         | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 69                   | 94       | M-W    | -                       | -                    | -                                            | Median                          | 30.9                 | 37.9     | <0.001       | 23                                         |
|                                         |                       | Body Weight                   | Body Weight (g)      | -                     | 69                   | 94       | M-W    | -                       | -                    | -                                            | Median                          | 225                  | 490      | <0.001       | 118                                        |
|                                         | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 69                   | 94       | ANCOVA | 0.004 <sup>e</sup>      | <0.001               | 35.3                                         | Adjusted Mean                   | 349                  | 399      | <0.001       | 14                                         |
|                                         |                       | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 68                   | 94       | ANCOVA | 0.003 <sup>g</sup>      | <0.001               | 35.3                                         | Adjusted Mean                   | 352                  | 401      | <0.001       | 14                                         |
| Camp Lake 2020 versus Baseline          | Survival              | Length Frequency Distribution | Fork Length (cm)     | -                     | 183                  | 94       | K-S    | -                       | -                    | -                                            | -                               | -                    | -        | 0.008        | -                                          |
|                                         | Body Size             | Fork Length                   | Fork Length (cm)     | -                     | 183                  | 94       | M-W    | -                       | -                    | -                                            | Median                          | 38.4                 | 37.9     | 0.492        | -                                          |
|                                         |                       | Body Weight                   | Body Weight (g)      | -                     | 183                  | 94       | M-W    | -                       | -                    | -                                            | Median                          | 500                  | 490      | 0.606        | -                                          |
|                                         | Energy Storage        | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 183                  | 94       | ANCOVA | 0.613                   | <0.001               | 36.5                                         | Adjusted Mean                   | 440                  | 445      | 0.471        | -                                          |
|                                         |                       | Condition                     | log[Body Weight (g)] | log[Fork Length (cm)] | 182 <sup>h</sup>     | 94       | ANCOVA | 0.784                   | <0.001               | 36.6                                         | Adjusted Mean                   | 441                  | 447      | 0.389        | -                                          |

 Area P-value < 0.1 or Interaction P-value < 0.05

 Absolute Magnitude of Difference ≥ 10% for Condition (EEM effect endpoint)

<sup>a</sup> The mean value of the covariate (that corresponds to the adjusted means for the response variable) for the parallel slope ANCOVA model or the minimum and maximum values of the overlap in covariate values for the interaction ANCOVA model.

<sup>b</sup> The median, mean (geometric mean for log<sub>10</sub>-transformed variables), and adjusted mean are reported for Mann-Whitney, t-test and ANCOVA, respectively, and the predicted mean values from the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction was detected.

<sup>c</sup> The magnitude of difference calculated as: [(exposed area mean - reference area mean) / reference area mean] x 100. When there is a significant interaction in the ANCOVA, the magnitude of difference is calculated at the minimum and maximum values of overlap in covariate values as : [(exposed area predicted mean - reference area predicted mean) / reference area predicted mean] x 100.

<sup>d</sup> Calculated as the maximum difference in the cumulative relative frequency distributions (CRFD) between areas. A negative difference implies that the exposed area has more fish less than the length where the maximum difference in CRFDs was observed. A positive difference implies that the exposed area has fewer fish less than the length where the maximum difference in CRFDs was observed.

<sup>e</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9783 and R2 of parallel slope model = 0.9772; a difference < 0.02) following Environment Canada (2012).

<sup>f</sup> One outlier (REF3-20-AC-03, Stdnt resid: -4.722) was removed from the analysis.

<sup>g</sup> ANCOVA proceeded under the assumption that the slopes are practically parallel (R2 of interaction model = 0.9807 and R2 of parallel slope model = 0.9796; a difference < 0.02) following Environment Canada (2012).

<sup>h</sup> One outlier (MLS-06-AC-11, Stdnt resid: 4.102) was removed from analysis.